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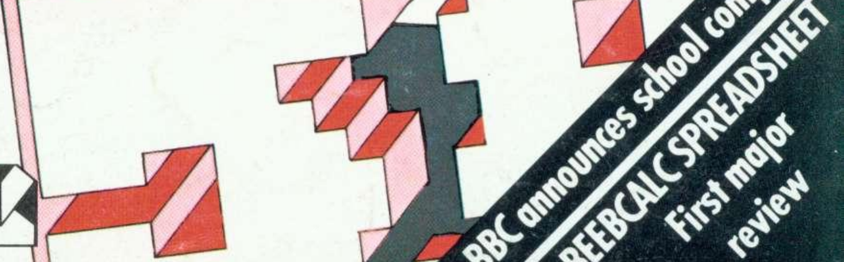
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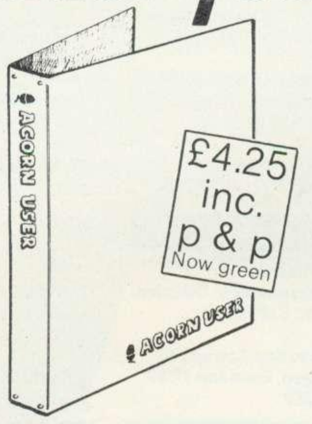
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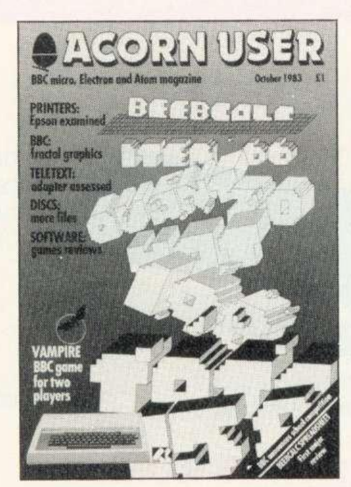
ACORN USER

OCTOBER 1983
NUMBER FIFTEEN

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EDITORIAL

WOULD you buy your daughter a microcomputer for Christmas? The answer, it seems, is no. The micro world is dominated by men, from the ones who build the machines, to the ones who sell them, service them – and finally buy them.

A boy is nine times more likely to be given a home computer: sexism begins at home. It may be compounded in schools by teachers who have a subconscious bias in the way they approach a subject – the 'hidden curriculum' – which reinforces traditional attitudes

A worrying example was provided by teachers who wrote to Ruth Townsend after her article in March's *Acorn User*. Half of her considerable postbag was addressed 'Dear Sir'. Is the same sexist attitude being carried into primary teaching?

The people who suffer are the girls and women who miss out on computers: the youngsters in schools, the O-level candidates, who end up as 'bored housewives' with a sleeping micro in front of them.

I use the phrase 'bored housewife' because that is how one woman described herself. A similar plight was humorously described last year in two *Acorn User* articles by Ronnie Rowsell – she could dust but never touch. But beneath the humour lies a serious matter.

Who's worried? Certainly the bored housewives, the Equal Opportunities Commission and teachers. But there is another concerned group back in the micro world – the very men who make and sell the machines and software. Because they have failed to sell to a large chunk of the population. And there's a fortune awaiting whoever cracks the feminine barrier.

When will the women step forward to tell the men what they want?

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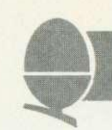
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Big changes as Acorn lines up major products

MAJOR changes at Acorn have produced a new line up within the company. This restructuring and a major marketing push are seen as grooming the company for a launch on the City's financial markets.

Electron is the spur, but the company is also planning a series of sophisticated products. It has established a large research team, and a chip design section.

The ABM outlined by Hauser in May's issue as a Torch-beater, is now scheduled for next year. A CAD graphics workstation based on the 16032 chip is underway, but no details are being revealed on a communications device. Several projects are being carried out for British Telecom.

Recent months have seen a spate of new appointments, with research group Orbis being taken into Acorn and Peter O'Keefe becoming sales director.

The launch of the BBC micro in the US (by Christmas?) will give a further boost to the company's turnover, which was more than £40m in the past year.

It is estimated this could double or treble in the next 12 months.



MOTOR racing is to benefit to the tune of £90,000 from sponsorship by Acorn. The company also hopes to develop a computer model of Europe's racing circuits. The money will go to David Hunt (James's younger brother) who drives for Eddie Jordan Racing team at Formula 3 level.

Second processors getting nearer launch

BOTH second processors are running to schedule for a release before the end of the year, claims Acorn.

The 6502 add-on was at the *Acorn User* Exhibition driving a Robocom Bitstick, and the Z80 is awaiting production of documentation. Acorn is stressing that it will not release the devices until they are totally ready.

The software package has been finalised for the £295 Z80 – which one spokesman estimated at worth almost £2000. Everything has been commissioned from well-established software houses and is designed for the first-time user, but with expansion in mind.

Three elements are involved: the CP/M operating system (version 2.2); languages, and office productivity software.

Digital Research has supplied the disc-based CP/M with standard utilities and GSX–Digital Research's graphics package which meets the international GKS standard currently being finalised. The 8k CP/M leaves about 53k of memory available to the user.

Several languages are provided. First is Cobol, complete with Animator and Focus-2 for debugging and writing screen layouts. Next are two Basics. One is BBC Basic II, the other nearer to Microsoft Basic, and designed to be compatible. A Z80 assembler enables the machine to read BBC discs.

US-based Chang Laboratories has provided the office productivity software. Memoplan, a wordprocessor; Graphplan a spreadsheet; Fileplan a personal database, and Mailplan to generate labels, etc, from Memoplan.

Compact Accounting, the British Financial software house, was commissioned to provide a nominal ledger, which combines a cashbook and sales and purchase daybooks – and the Nucleus System Generator which gives the ability to produce tailor-made programs, such as a report generator.

An Acorn spokesman described the accounting system as 'a simple book replacement.' However, he went on: 'It's a very professional system designed to meet auditor standard. We've used professional accounting experience to produce these.'

The software, he said, was very user friendly, and is command-driven with split-screen working. It is personalised to the BBC.

How fast is it? 'Well,' said the Acorn man, 'an IBM PC is slower than a BBC micro with the Z80.'

Software group joins education support

THE educational services division has been disbanded and its role absorbed by the customer service, international, sales and finance sections of Acorn.

This marks a major change in policy with Maurice Edmundson taking over the education chair from John Coll who has moved to the MEP (page 18).

Edmundson has just retired from a senior position with the government's schools inspectorate. He played a major role in setting up the MEP and liaising between the departments of industry and education over the micros in schools scheme.

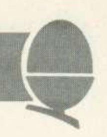
The other major addition to the set-up is CES – formerly the computer education division of computer giant ICL. The group was formed 12 years ago and according to joint Acorn boss Chris Curry 'will make a first-class contribution to the school curriculum.'

CES will be moved from its present Reading base to Maidstone. There, said Curry, it will play a major role in promoting Acorn's educational products to high-ranking overseas visitors flying into Heathrow.

The group expects to launch several packages this year, backed up by teaching aids and pupil handbooks. These will include simulation software.

Commissioning, licensing and distributing software will be part of CES's brief, under the control of Acorn international. Heading this group is Geoff Wood, himself a former ICL man.

Acornsoft will continue to commission education software, and has signed distribution contracts for BES and ASK ranges.



Telesoftware service ready to go

THE BBC's telesoftware service is due to be launched on September 20. Programs have been going out for several months, but only as part of trials for the Acorn adapters which download transmitted programs directly into the Beeb's memory.

Five or six 'meaningful' pieces of software will be broadcast said Lawson Brown, head of the Ceefax Telesoftware Service. These will be aimed at schools and will come from the MEP and Brighton Polytechnic which has played a major role in developing the service.

BBC Publications is funding some of the initial projects which are being linked to traditional broadcasting in the schools service.

Another idea being considered is maintenance for software which needs regular updating, for example income tax and financial packages. In this way, programs could include a guaranteed future back-up in their initial cost.

Good TV reception is vital for telesoftware. The odd error in ordinary Ceefax transmissions merely results in a spelling mistake, but a corrupted character in telesoftware is likely to prevent a program being downloaded.

Production versions of the telesoftware filing system (TFS) will employ a 'cyclic redundancy check' to ensure rubbish is not downloaded.

The telesoftware adapter, which costs £225, is designed to work at a reception strength of 800μV, but in practice works with a signal as low as 200μV. This signal strength can be checked by a TV engineer.

Lawson Brown plans to set up a club page for software and it is hoped to give an exclusive sweat shirt to contributors.

The BBC is seeking transmission rights for software. This will be broadcast in a cycle, with programs going out for four weeks in six months.

There is no reason why software should not be broadcast for other micros, but this depends on the availability of adapters.

If you have any contributions or want more information, contact: Telesoftware, Ceefax, BBC TV Centre, Wood Lane, London W12 7RJ.

The live BBC TV broadcast on October 2 will include a demonstration of telesoftware (see page 10).

A review of Acorn's teletext adapter is given on page 93.





Two examples of the sort of telesoftware pages Ceefax will broadcast. Acorn's teletext adaptor costs £225, and news of the new service is carried on Ceefax pages 703 and 704. Initial programs will be provided by the MEP for downloading at home and in school.

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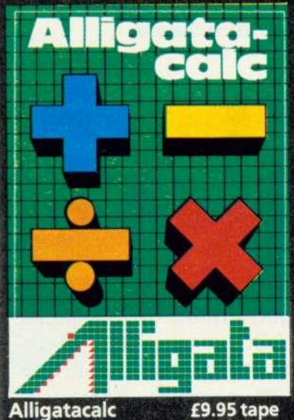
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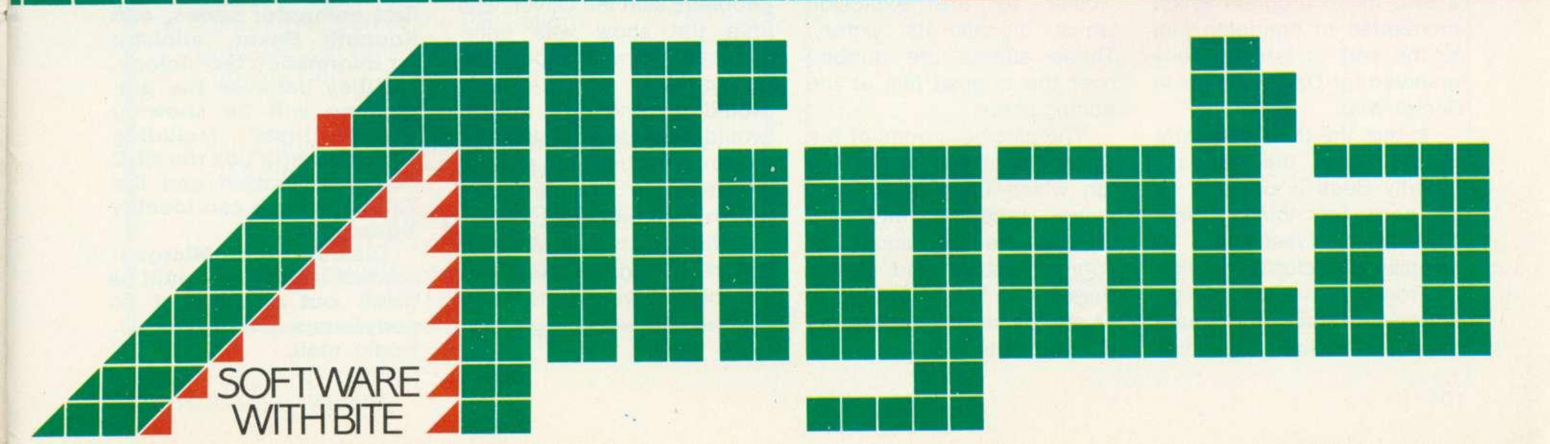
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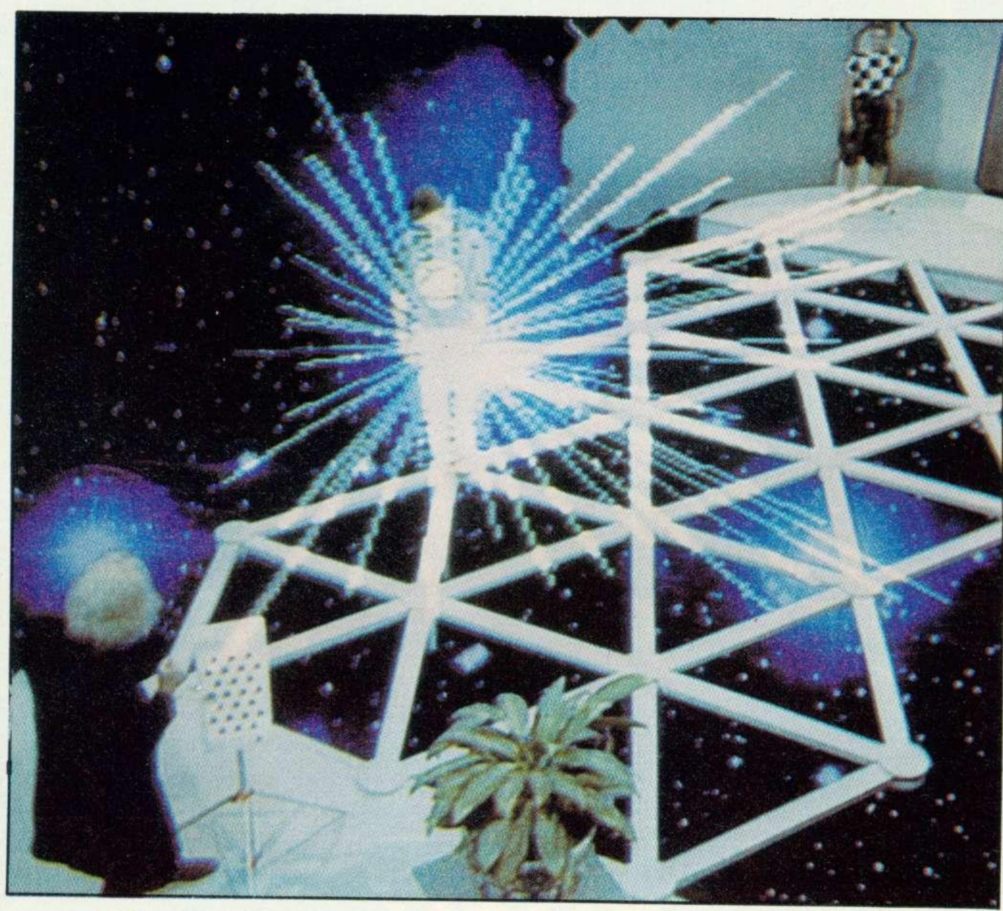
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The dreaded Vortex consumes another victim in *The Adventure Game*

TV adventure show

LEGEND already has it that there's a tall fair-haired chap wondering around the BBC's Wood Lane studios muttering 'If only I'd thrown the cheese roll'. And it's all because he appeared in a harmless-sounding TV series called *The Adventure Game*.

Actor Paul McDowell was a guest in the zany children's programme and using the piece of BBC-canteen catering could have saved him from the wrath of a BBC micro program which proceeded to condemn him to the sort of fate formerly reserved for Dalek victims in *Doctor Who*.

In this, the third *Adventure Game* series, the normally friendly Beeb is used to do all sorts of things, from obliterating guest stars to compiling the closing credits.

From the moment an episode of the programme starts, familiar graphics spring up. The opening credits are based around Acornsoft games, such as *Snapper, Monsters* and *Planetoid*. And legging across these arcade favourites are three tiny characters superimposed from another program devised by series producer Ian Oliver.

You'll notice several sound effects produced by BBC micros, and some special visuals – from the deadly Vortex (Paul is its victim) to the explosion which signals its victory. These effects are dubbed over the original film at the editing stage.

The closing credits of the dragon-inhabited planet Arg (on which the Game takes place) receding into the distance to the sound of John Williams and Julian Bream are Beeb-generated, as are the credits themselves (mode 7 lettering).

It all works very well, thanks to a piece of gadgetry fitted to the micro by BBC engineers which synchronises its graphics to the TV cameras. This was originally developed for the *The Computer Programme*, but now means the Beeb is popping up in several series to provide graphics and titles.

But it wasn't as simple filming the series as it looks in the end. The main problem, said Ian Oliver, was that the show was unrehearsed. It was impossible to predict what people would do and how long it would take them. Also the adventurers missed several elements in the dire plot which awaited them.

'The guests were briefed before filming,' said Ian,' but we only gave them vague

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Live BBC show to launch £25k competition

THE BBC's live micro show in October will launch a schools software competition with prizes worth £25,000.

Announcement of the competition will round off the two-hour programme which goes out on Sunday morning, October 2. It will go out in front of a studio audience and feature phone-ins, live demonstrations, interviews and a resident 'expert' panel.

John Coll and Ian McNaught Davis will be the front-men, while programming duos from Acornsoft, Research Machines and Psion will be in the background writing software on a topic assigned at the start of the show.

Studio demonstrations are planned on music, telesoftware, telephone communications, video subtitles, graphics and input by devices other than the keyboard.

Director Patrick Titley and the rest of the team from *Making the Most of the Micro* have been reassembled to put the show out. Guests will include Lawson Brown, head of the telesoftware service, Richard Fothergill of the MEP, John Vince from Middlesex Poly on graphics, Ian Trackman and David Ellis from the first computer series, and Kenneth Baker, minister for information technology.

Titley believes the programme will be showing several 'firsts', including the video title box the BBC hopes to market and the Telepad which can identify signatures.

Dialcom and Micronet contact numbers should be given out at the start so people can call in by electronic mail.

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Excellent use of the high-res graphics help to make this the most flexible chess game available. A choice of hundreds of different skill levels control the playing strength. This game has been continually updated over the past few years and this latest version incorporates a host of new facilities, including the ability to:

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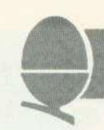
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▶ page 10

clues. After that, they were on their own.' Thus, much of it was down to luck, with Ian and Patrick Dowling, who wrote and devised the series, barely able to look. In one episode, two out of three guests get across the Vortex. 'That was the first to be filmed, and their success rate was never to be repeated,' Ian explained, rather sadly.

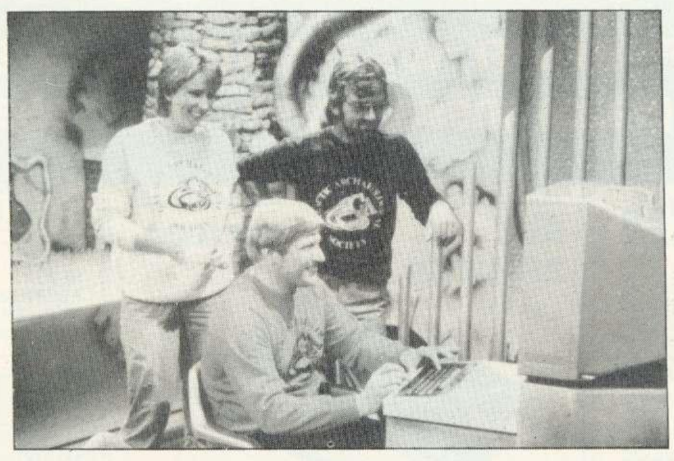
One example of things missed by the guests is the 'egg-tube' in the fourth show. It's set up by Gnoard (the fumbling Arg TV presenter) and Rondag (the rubber-mouthed, gum chewing, backwards talking, beachcomber) in the fourth episode, but all the guests ignored it!

Then there was the maze. Ian Oliver again: 'We wanted to run a maze on the BBC, but we had trouble with the programming. Acornsoft weren't able to do it, so I handed it over to the series advisors – and they had problems. In the end, the night before filming, I was up until six in the morning getting it right.'

There were fewer problems with the *Drogna* game. In the series this is played on a triangular floor grid between The Red Salamander of Zardil and the guests. Players have to reach the top of the grid by stepping between coloured shapes, pick up a special crystal, and get back again. A computer version has been written by Patrick Dowling and is being marketed by Acornsoft.

The main problem for the contestants is that the Salamander (seconded by gum-chewing Ron looking suitably lizard-like) cheats by inventing new rules as he goes along.

The Adventure Game will be screened on BBC in the new Autumn season. Patrick Dowling, the brain behind the torments of the series is off to Australia, so perhaps cheese-roll tortured Paul may have the chance to recover. Meanwhile, it's 'Gronda Gronda' from Arg or 'Aliehs diputs' as Rondag would say.



Another intrepid trio interrogate the Beeb for clues

Dutch radio software

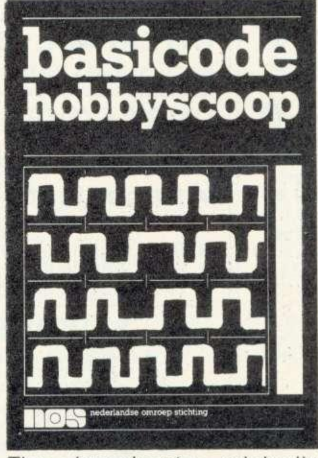
DUTCH radio station NOS is broadcasting software in a subset of Basic compatible with 20 machines – including the BBC micro.

The programme *Hobbyscoop* (Hobbyscope) goes out on Sunday evenings on 747 kHz or 401m. It is mainly in Dutch but an explanation of the software is given in English at around 17.40 GMT (18.10 in the winter).

The first software was broadcast back in 1978 for four computers – each catered for in weekly cycles. In 1983, Basicode 2, a computer 'esperanto', was developed which could be run on far more machines.

The programme is edited by Hans Janssen, in cooperation with TELEAC – the Dutch equivalent of the Open University. He estimates six countries receive the broadcasts, including England.

A book (in Dutch and English) and a cassette containing a loading translation program are produced to accompany the series.



The broadcasts originally catered for the Atom, but this was dropped because of difficulties with the dialect, and the appearance of the BBC Basic board.

Another NOS programme, *Radio-Activity*, produces an English language transcription of Basicode programs which is available for other radio stations to broadcast.

Details of the service, which is non-profit making, from: Hobbyscoop, PO Box 1200, 1200BE Hilversum, The Netherlands.

News in brief

SIR Computers look set to beat Acorn to production of an interface for the Electron.

The company demonstrated a prototype at the *Acorn User* Exhibition which gave joystick and printer ports.

HIGH Street chain W.H. Smiths will stock the Electron alongside the BBC micro. A spokesman said it would be 'the only multiple retailer' doing so.

SCHOOL administration is covered by Studentdata – a disc database which is claimed to cope with up to eight school years and 390 facts on each student.

The 40-program suite is provided on disc with manual for £167. ESC, 50 Pope Rd, Bromley, Kent BR2 9QB.

WATFORD Electronics has expanded its BBC range to include an EPROM programmer at £72, speech synthesiser based on allophones at £39 and machine code monitor on ROM at £18. (All exclusive of VAT).

UTILITIES in a ROM from Softsmith include a disassembler, memory editor, search/replace, variable dump and printer options.

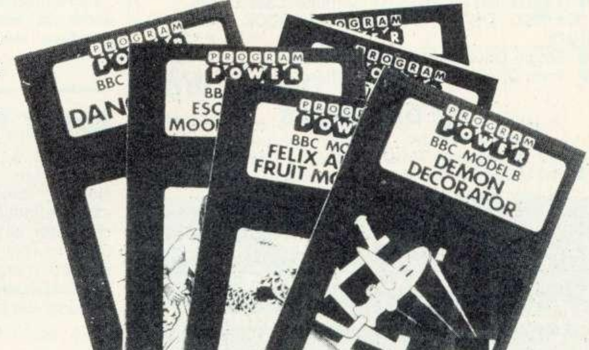
The 4k EPROM costs £12.95, is called 'Aids' and is produced by Softsmith at 9 Back Green, Hersham, Surrey, KT12 4HY.

THE Scottish Home Computer and Electronics Show has been set for November 11-14 at the Anderston Centre in Glasgow.

PP hits 45-mark

SIX new titles have brought Program Power's range up to 45. The half-dozen is made up of: Felix in the Factory, Felix and the Fruit Monsters, Bandits at Three O'Clock, Escape from Moonbase Alpha, Demon Decorator and Danger UXB.

The packs listed above cost £7.95, apart from Bandits which is a two-player game at £6.95.



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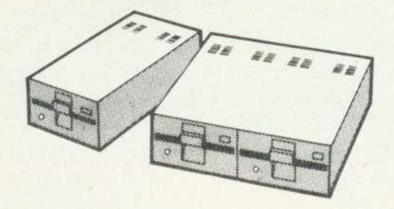
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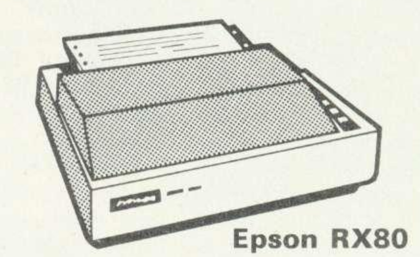
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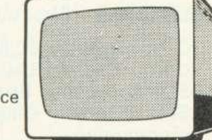
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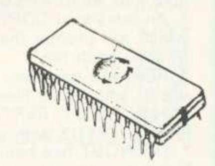
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Kit Price: **£8.95**

WATFORD ELECTRONICS

Continued →

★ NEW ★
BBC MICRO DFS

by Watford Electronics

This powerful new DFS is fully compatible with ACORN DFS yet has much increased power due to additions, carefully designed to make life easier in normal use. It consists of over 14K of efficiently written machine code. It is entirely self contained and so does not require a utilities disc to function.

* The system can either use the ACORN standard 31 files per disc side or DOUBLE THE CAPACITY to 62 files. The size is selected at formatting time. Copying between discs with different catalogue sizes works perfectly normally.
* A FORMATTING PROGRAM is built in, permitting formatting to 35,40,80 track formats with either 31 or 62 files. Since the formatter is built in to the DFS it can be used without affecting whatever program you are using.
* A DISC VARIFIER is also built in. This checks the internal checksums on each sector to identify any corrupted data. This is extremely useful when saving valuable data as it shows faulty discs quickly and easily. Again it does not affect the program you are using.
* A built in DISC SECTOR EDITOR gives a screen window onto the disc enabling detailed editing of any byte on the disc. This is very useful for recovering accidently deleted files and can save weeks of work.
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* A WORKFILE function sets the name to be used when the null filename is issued. This allows a program to be edited and repeatedly saved having only typed its name once.
* When using LOAD, CHAIN, etc. it is possible to specify an ambiguous filename. This will result in the first file whose name matches the specification being used. This saves typing the end of a filename that you know is uniquely identified by its first few characters.
* Two commands exist to simplify the transfer of programs from TAPE TO DISC. These load the file to &1200, switch off the disc system and then move the file to its correct load address; thus saving a lot of complicated programming. This command can be used to load files up to 27.K5 long.
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* OPENOUT has been improved to give you fewer annoying 'Can't extend' errors, as it automatically picks the biggest space on the disc in which to put a file. A SPACE command lets you know how much space *COMPACT could create before you waste time doing it.
* 1.75K of RAM can be taken over from the DFS for your large BASIC programs while still retaining LOAD, SAVE and *CAT and other simple commands.
* Comprehensive and clearly written Manual (available separately) gives the user a complete package deal.

Price: **DFS ROM** ONLY **£42**

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We will exchange your existing ACORN DFS or AMCOM DFS for the highly superior Watford's DFS ROM for **£35**

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This language is very popular in American schools as it is an ideal educational program. It can graphically demonstrate the ideas of defined procedures, sub-routines, loops and even recursive programming. Gives excellent introduction to LOGO language for young and old alike. **£9.95**

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N.B. All the above Gemini software is on tape. For Disc Based (40/80 track) please add £3.

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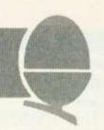
BBC DFS MANUAL

A fully comprehensive disc manual for BBC Micros. All extra commands are included. A bargain at **£7.50** (no VAT).

BBC MICRO ROM PAGING SYSTEM Explained

A comprehensive explanation of the requirements for Sideways ROMs to be used in the BBC Micro. Language and Service entries are explained with their call numbers. This book contains all the information that we have discovered in writing our 16K BBC DFS. A must for all serious users of BBC Micro.

£2.75 No VAT



Six packs follow up BBC range

BBCSOFT has launched six program packs covering a wide range of topics. This follows its original set of nine, which were not well reviewed.

The two games are *Dr Who* and *Canyon* at £10. The first is described as an adventure, but is really a series of four arcade-type games. *Canyon* is a dodge the walls and blast everything in sight game.

Record Keeper (£13.80), *VU Type* (£16.10) and *Taxcalc* (£17.25) are of a more serious nature. The first is a general purpose database, the second a typing tutor developed with Pitmans.

Taxcalc is the Which? income tax calculator (1982-1983) and comes with a 55-page booklet of advice, information, references – and a section on challenging the taxman.

The final package is *White Knight* – the BBC Chess Master. It has an amazing range of options including blindfold playing, clocks, setting up problems, tournament parameters, two-player games and the computer playing itself.

At first sight, the programs are a distinct improvement on the first set, but are not scheduled for release until the end of September. All come with manuals. See page 74 for review of *VU Type*.



Database and game feature in Auntie's new half-dozen

Be proud, says Australia's Napier

A LEADING Acorn distributor has hit out at the 'wingeing attitude' of the British Press and public towards the BBC micro.

In a forthright interview at the *Acorn User* Exhibition, Bob Napier, technical boss of Barsons, Acorn's Australia and New Zealand distributor cited the 0.1 operating system row as a classic example.

Describing the BBC OS as better than CP/M, he said: 'Customers in Britain should have had to pay full price for the upgrade – and should be proud of the BBC micro.

'People don't realise what they are getting. Britain is the only place in the world where the BBC micro could have happened.'

In Australia, the 1.2 upgrade was provided free of charge, he added – and DFS 0.9E is standard. But the BBC micro sells for $1550 (about £900), which is not much short of the price of an Apple. 'We are running rings round distributors in GB – but the customer is paying for it,' explained Napier.

He justified the price by quoting the import and distribution costs in Australia – and the level of dealer support. 'Dealers can't operate at the minimal margins used in Britain. Their overheads are higher and they cannot get the same volume (just under 3000 BBC micros have been sold in Australia of the 150,000 Acorn claims to have made).

'Added to that, the BBC still gets its percentage on every sale without giving anything like the level of support as in GB. There's no literacy scheme or network of referral centres, and the TV programme has only been shown in schools broadcasting.'

But Napier did have good words for the Microelectronics Education Programme, which he regards as the most important step in computers in education. Funding from the MEP had made software and hardware developments possible which would not otherwise have been possible, he said.

News in brief

A SECURITY EPROM for the BBC micro disables the machine until a five-digit code is entered.

The chip fits into the first ROM socket (IC101) and causes the owner's name and address to be displayed when the machine is switched on.

The EPROM comes with two warning stickers and costs £15. Details from: Software Services, 65 South Mossley Hill Road, Allerton, Liverpool L19 9BG.

CIRCUITS with up to 16 nodes and 60 components can be analysed for output and input impedence, gain and phase using a program from Number One Systems.

The program was developed on the Beeb for internal use to simulate most devices, including operational amplifiers in any combination. Contact 9A Crown St, St Ives, Huntingdon PE17 4EB.

SEVEN software packs have been produced by CUP with the MEP. They cover maths, molecules, electricity, diet, population, and map skills. Disc and cassette versions cost £13.95 plus VAT.

INVOICES, ledgers, payroll, stock control and order processing are covered in disc systems from HCCS.

At £60 each, the range is designed to handle the financial side of a small business. Contact 22 Market Square, Biggleswade, SG18.

Coll quits Acorn for MEP software unit

THE Microelectronics Education programme has set up a software unit to establish guidelines on software and development of the computer curriculum in schools.

John Coll, who recently resigned as educational services manager at Acorn, will head the new unit based in Cambridge. He is a keen advocate of electronic information systems (readers will remember his article in last October's Acorn User), and will be working on telesoftware and electronic mail. Coll helped produce the set of software guidelines presently available from the BBC, and is expected to work closely with that organisation in drawing up a more substantial set of rules for program writers and publishers.

The BBC micro *User Guide* was written by Coll and he is a consultant to the computer literary scheme. He appeared several times in both BBC TV series on micros.

The MEP has been working on the problem of assessing software for several months and looks set to draw up a list of 'approved' products. These may then be made available under Department of Industry funding, although the exact timing and extent of the scheme is not yet certain.

Bill Penfold finds one fact of life which shouldn't be so

Why the girls don't compute

What are little boys made of?
Bits and bytes,
And chips and bugs,
That's what little boys are made of.

And what are little girls made of?
Still sugar and spice,
And all things nice,
. . . And that's the problem!

PROBLEM! What problem? Well partly that too many teachers still fail to recognise that girls are often left behind in the classroom conversion to computer literacy.

And it's a real problem. For it is becoming increasingly evident that computing is massively male oriented... and this applies to schools as much as anywhere else.

The male predominance with micros is already so established that it is regarded as natural. Which is crazy for a field which, in theory, should be ideally suited for either sex.

But you only have to look around the average computer shop on a Saturday or a micro exhibition to see it is the lads and their dads who mainly populate the world of personal computers.

Does it matter though?

After all it's a free country, more or less, and enthusiasm for personal computers – or lack of it – is merely personal preference.

But what may be just a fact of life for the salesmen could prove a serious long-term disadvantage for girls in the classroom.

Pretty convincing evidence of this is already emerging from the comparisons of boys and girls taking 'O' level computer studies and 'A' level computer science. For a start, there are less than half the number of girls to boys sitting the 'O' level. If that's not bad enough the ratio at 'A' level drops to about only one in five.

Why should this be? As with so many things the reasons are varied, complex and to a large extent, not entirely clear. But at least an attempt is being made to find some of the causes – and if possible supply the remedies.



'Very nice dear, but right now I think she'd prefer a fluffy toy'

Appropriately it is the Equal Opportunity Commission (EOC) which has begun investigating the problem.

A year ago the Commission linked-up with Croydon Education Authority, and this September a two-year project begins to try to find ways of attracting girls to computer studies and encouraging them to get more 'hands-on' experience.

A start is being made by trying to alert teachers to the problem – a problem which too frequently occurs unrecognised.

Tricia Strong is the director of the Croydon project, which has been lumbered with the title of Information Technology Curriculum Development.

It is not that teachers are consciously discriminatory, most, she is certain, attempt to be fair. 'It is the little things which make a difference,' she explains.

'For instance, a teacher asks an open question during a computer studies class and the chances are it will be the boys who want to answer. Now maybe the question should be directed at the girls first.'

A significant part of the problem, says Strong, is that in many schools computers are still regarded, first and foremost, as a maths or science subject.

'It is a 'perceived link' which colours people's views. The result could be that possibly we are not getting enough of the right sort of teachers involved in the subject, teachers who are concerned with communications.'

Her views are echoed by the EOC's principal education officer Lynda Carr.

The Commission has become concerned at indications that computer studies are going the same way as physics and maths – subjects notoriously less popular with girls

Carr believes the best way to influence the attitudes of teachers is while they are still in training.

It is for this reason that the EOC has suggested to the Department of Education that teachers sent on computer training courses should be drawn more from the 'humanities' rather than the seemingly inevitable dependence on science and maths departments.

The reasons she says is that computer studies and information technology are, to a considerable extent, all to do with communications.

'And the best person for teaching communication is a good communicator, and that is very often a teacher trained in humanities,' adds Carr.

Another factor which is increasingly being recognised is that boys are much more aggressive in demanding to try out a computer.

While boys assert themselves, girls often stand back, passively adding to the impression that they are uninterested or apathetic.

To counter this problem some schools are now leading the way with separate computer clubs for boys and girls. In the 'sheltered' environment of their own clubs girls are gaining experience without the hassle of competing.

The blame though is not the teachers' alone. Not by a long way. Parents seem to be the prime example of discriminatory attitudes towards home computers.

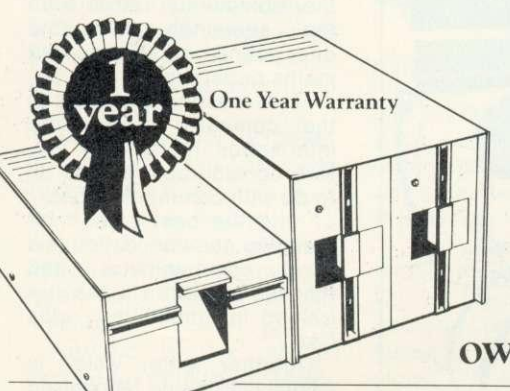
For a boy is nine times more likely to be given a home computer than his sister – and of course it is often the interest built up in the home which helps lead to greater understanding in the classroom.

Tricia Strong fears that home computers are often regarded by parents as the modern-day equivalent of a Meccano set – a 'boy's present.'

Their attitudes in turn influence those of their children with the inevitable result. Certainly it is easy to see that if daughters are told 'that's not the sort of thing for a girl' their chances of becoming competent, let alone fluent, in computer literacy are pretty dim.

Microware presents the latest news on BBC.

N.B. 40/80 Format Switch – call for information



ZL DISK DRIVES

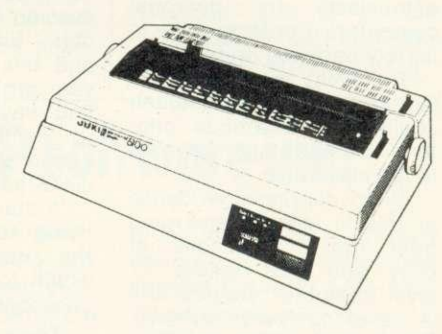
Reports are coming in that Microware, the authorised dealers for BBC and Epson, are being inundated with orders and enquiries from BBC micro owners. It is believed that this unprecedented activity is the result of the wide range of products on offer and the competitive pricing policy of the company. The most dramatic recent development is the exclusive ZL range of floppy drive sub-systems.

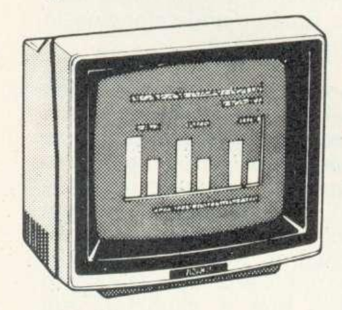
Type		Capacity in MFM	Capacity BBC in FM	No. of files on BBC	Price	Members discount %
ZL141B	Single no PSU	250K	100K	31	175.00	10
ZL141	Single plus PSU	250K	100K	31	225.00	5
ZL142	Single plus PSU	500K	200K	62	315.00	5
ZL241B	Single no PSU	500K	200K	62	220.00	10
ZL241	Single plus PSU	500K	200K	62	265.00	5
ZL242	Single plus PSU	1Mb	400K	124	415.00	5
ZL291B	Single no PSU	1Mb	400K	62	290.00	10
ZL291	Single plus PSU	1Mb	400K	62	355.00	5
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N.B. 40/80 Format Switch – call for information DFS Manual – Format disk available.

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MONTE CARLO & PI

Stan Froco explains how random numbers are used for high precision tasks in computing

IT IS a strange fact that some of the highest precision tasks in computing are best carried out using random numbers. Such techniques are called Monte Carlo methods after the town famed for its gambling. The example here has been told by various people in various guises. This particularly simple program is due to Robert Folkes and Ron Swail. It calculates the value of π(pi the ratio of the circumference of a circle to its diameter).

Take a look at figure 1. It's a box, with corners at the coordinates shown, inside of which is a circle of radius 0.5. The area of the square (which has a side of length 1) is 1, whilst the area of the circle is given by the formula: πr^2 which is $0.25*\pi$. The ratio of the area of the circle to that of of the square is therefore: $(0.25*\pi)/1$.

This ratio can surprisingly be worked out using random numbers. Let us scatter points at random all over our square and circle. The number of points falling in the square will be proportional to the area of the square, and the number falling within the circle will be proportional to the area of the circle.

```
 10 REM*******************************************************************
 20 REM*                                                                 *
 30 REM*            Monte Carlo method to find PI                        *
 40 REM*
 50 REM*******************************************************************

 60
 70 time% = TIME
 80 INPUT "Number of iterations? " it%
 90 guess = FNevalpi(it%)
100 PRINT "PI is approximately: " ; guess
110 PRINT "Time taken: " ; TIME - time% ; "cs"
120 END

130 REM*******************************************************************
140 REM*                                                                 *
150 REM*              FNevalpi                                           *
160 REM*                                                                 *
170 REM*   Generate num% points within a box with coordinates:           *
180 REM*         ( 0.5,  0.5)                                            *
190 REM*         ( 0.5, -0.5)                                            *
200 REM*         (-0.5, -0.5)                                            *
210 REM*         (-0.5,  0.5)                                            *
220 REM*   Count all those lying within a circle of radius 0.5 centred on *
230 REM*   the origin                                                    *
240 REM*
250 REM*******************************************************************

260

270 DEF FNevalpi(num%)
280 LOCAL in%,i%,x,y

290

300 in% = 0
310
320 FOR i% = 1 TO num%
330 x = RND(1) - 0.5
340 y = RND(1) - 0.5
350 IF x * x + y * y < 0.25 THEN in% = in% + 1
360 NEXT i%
370
380 = in% * 4 / num%
```

Program 1. To calculate Pi





Let s be the number of points falling in the square, and c the number in the circle. Then:

area of square αs
Hence area of square = k*s (where k is an unknown constant).

Also, area of circle αc
Hence, area of circle = k*c (where k is the same unknown constant).

The ratio of the two areas is therefore given by (k*c)/(k*s) =c/s. But we already know this ratio, it is

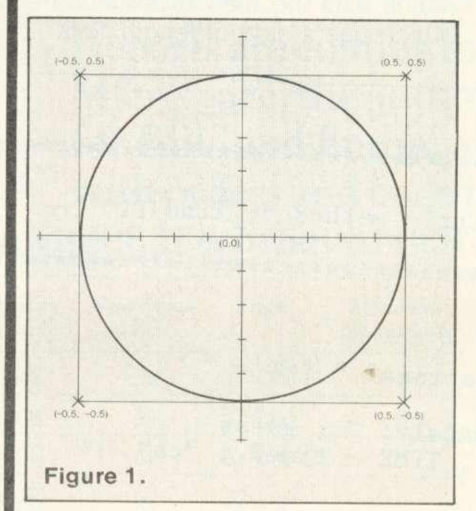


Figure 1.

(0.25 * π)/1. By a little algebra we can do the following:

$$\frac{0.25 * \pi}{1} = \frac{c}{s}$$

$$\text{Hence} \quad \pi = 4 * \frac{c}{s}$$

If we can count c and s then we have a formula for approximating pi. The value s is easy: any point with an x-coordinate of less than 0.5 and greater than –0.5, and y-coordinate of less than 0.5 and greater than –0.5 is in the square. In practice we simplify this by only scattering points within the square (nothing outside is of interest). But c is a little trickier. For a point to be within the circle it must be less than 0.5 away from the centre of the circle (0,0). A little geometry is needed. Consider the point (x, y) in figure 2. We wish to find p, its distance from (0,0). This is shown as a right angle triangle. The two shorter sides have lengths x and y. The longer side has length p, which is related to the other two by Pythagorus's theorem:

$$p^2 = x^2 + y^2$$

A point (x,y) is thus in the circle if p is less than 0.5, ie,

$$x^2 + y^2 < 0.5^2$$

We thus have all the information needed to calculate an approximation to pi. Program 1 is a suitable version in Basic. This allows you to vary the number of points you read in before calling FNevalpi which scatters that number of points over the square, counting those that fall within the circle. It then uses the above formula to calculate an approximation to pi. Using more points gives a more accurate value. However, this is not the most valuable example of a Monte Carlo method. To add one more figure of accuracy to the approximation takes 10 times as many points, and much better methods exist to calculate π. In addition, it is subject to random fluctuations. We can

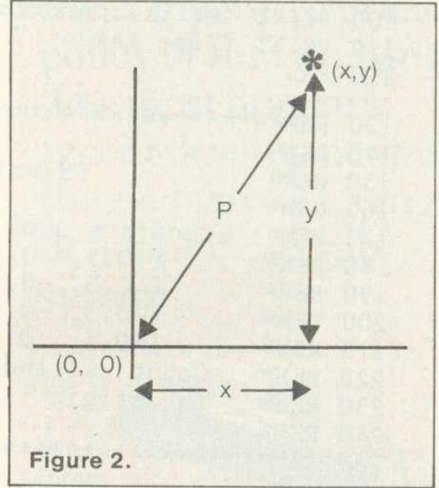


Figure 2.

really ony talk of the probability of this being accurate to so many figures. If by chance all the points landed outside the square the answer would be a poor approximation. This is highly unlikely, but is a consequence of using this particular method.

For certain other problems, Monte Carlo methods are the only viable techniques. One of the fastest known ways for testing if a number is prime is a Monte Carlo method. This in fact only tells you a number is *probably* prime, but the likelihood of it being wrong is very small.



BACK IN THE DUNGEON

Simon Dally tempts would-be adventures with a Seikosha printer-hidden in a fridge!



LAST month we left you hot on the trail of three Seikosha printers donated by Microage Electronics. In the dungeon beneath our offices in Bedford Square those of you progressive enough to try found yourselves at the doors of a Tardis, where the first printer awaited.

This month, to find the second printer, you have to descend to a lower level of the dungeon. Here, while the basic mix of dungeon-dwellers remains much the same, there are some complications.

Regular readers will recall that dwarfs always tell the truth and trolls always lie. But on this level (known as the asylum level) about half of the inhabitants are absolutely barmy and wholly deluded in their beliefs. The other half spend their time looking after them and trying to understand the competitions in *Acorn User.*

In practice, as before, things can be worked out logically. Barmy dungeon-dwellers genuinely believe the truth is the opposite of what is in fact the case. Thus there are four types of creature:

- Sensible dwarf.
- Barmy dwarf.
- Sensible troll.
- Barmy troll.

Now, suppose you were to pose the question, 'Do 100 pence equal £1?', the answers would be as follows:

- Sensible dwarf: Yes. (Always tells the truth.)
- Barmy dwarf: No. (Genuinely believes the opposite of the truth.)
- Sensible troll: No. (Knows 100p = £1 and then lies.)
- Barmy troll: Yes. (Believes 100p does not equal £1 and then lies about it.)

Effectively, therefore, the sensible dwarfs and the barmy trolls always tell the truth, the former for the sake of honesty, the latter because they always believe the opposite of the truth and then lie about it.

As happened last month, you begin your search for the printer with a microcomputer, truth tables and a number which you modify as you travel from room to room in the dungeon and receive instructions from the characters you encounter. Bear in mind the following rules (laid down by that fine and sensible dwarf, the Editor):

a) When confronting a sensible dwarf or a barmy troll do exactly what you're told.
b) Do the opposite of what a barmy dwarf or sensible troll tells you ('opposite' in this case means divide when told to multiply, add when told to subtract, square instead of finding the square root, and *vice versa.*)
c) When it is logically impossible to know whether a character is a troll or a dwarf do what any sensible character tells you and do the opposite of what any barmy character advises.
d) When it's not possible to tell whether a character is barmy or sensible follow the advice given if the character is a dwarf and perform the opposite if he's a troll.
e) If it is not possible to determine from the information given whether a character is either barmy, sensible, a dwarf or a troll, merely add 2000 to your answer.
f) If at any stage you find your number is a decimal, turn it into an integer by rounding it down according to the Basic statement INT(X).

As before, you are first equipped with a traveller's problem guide – it was compiled by a sensible dwarf and you won't get far without solving the questions.

Problem 1. At a dungeon party, the only people forbidden to come are those born on 29 February. How many dungeon dwellers have to turn up before the chances of three of them sharing the same birthday are greater than one in two?

Problem 2. It is suspected (but not proven) that every integer can be made into a 'palindrome' (a number which reads the same backwards as forwards) by continually adding the reverse of its digits to itself. Thus:

25	59	24653
52	95	35642
77	154	60295
	451	59206
	605	119501
	506	105911
	1111	225412
		214522
		439934

Find the lowest three-digit integer whereby, using this method, a palindrome has not appeared after 100 steps.

Problem 3. Legend tells of a great general, Julius Dwarf, who believed in the power of the phalanx (a perfect square of soldiers). He also believed in retaining maximum flexibility when waging war, so much so that he decreed that his army had to be capable of forming two phalanxes in 12 different ways.

What was the smallest number of soldiers he would have needed to achieve this ambition?

Problem 4. In the Tardis, the on-board computer requires the setting of three different coordinates to



travel through time and space. Each coordinate is a positive integer consisting of three digits. To teleport to the next level of the dungeon (where the second printer is located in the combination-locked personal fridge of the Managing Director of *Acorn User*, you have to set the coordinates so a*b*c comes to a number 1 more than 1.6 million.

What is the result of subtracting both the two lower coordinates from the higher one?

Off you go then.

As you emerge from the teleported Tardis a character informs you, 'I'm a dwarf or I'm sensible. Your starting number is the solution to problem 2 minus the solution to problem 1.' Being logical, you reason, 'He must be telling the truth or lying. If he lies he is neither a dwarf nor sensible. Therefore he would be a barmy troll. But this doesn't work because barmy trolls tell the truth. Therefore he is a sensible dwarf and the starting number is as he says.'

In room 1 a character leaps up and declares, 'I am not a sensible dwarf. Multiply the solution to problem 1 by 5.'

In room 2 you are confronted with someone who declares, 'I am a troll. Add the answer to problem 2 to your number.'



In room 3 you strike up a conversation with the resident caretaker and ask him, 'Are you sensible?'. He replies 'Yes', then he tells you to multiply your number by the answer to problem 3.

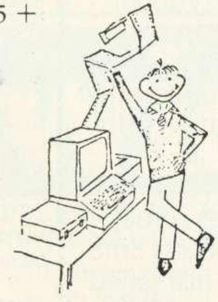
In room 4 you ask the character, 'Are you a sensible dwarf or a barmy troll?' and he replies, 'Yes. Add the solution to problem 4 to your number.'

In room 5 you ask the dungeon-dweller, 'Are you a dwarf?' He replies, 'Yes. Divide your number by the solution to problem 3'.

In room 6 you ask the caretaker, 'Are you an insane troll?'. From his reply you know instantly what type he is and you therefore know what to do when he tells you to divide your number by the sum of the digits in the solution to problem 4.

At long last you reach the MD's fridge. There is a character here threatening to stab to death anyone who helps himself to the coveted printer within, unless he is provided with the three-digit code number. What is it?

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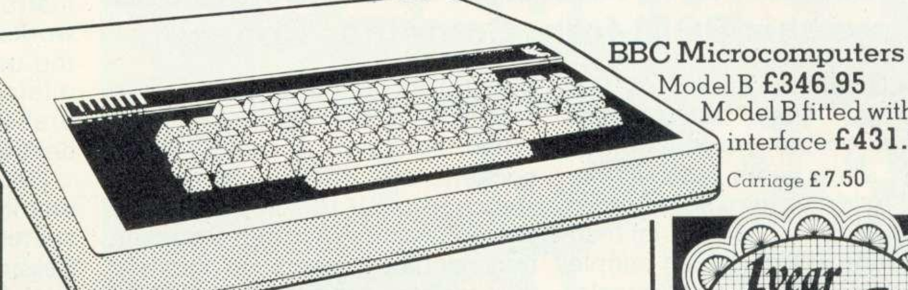
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BEEBCALC

Joe Telford introduces and explains the term 'spreadsheet' with reference to Beebcalc, and reviews this ROM from Computer Concepts

THE OLD timers among us will remember the amazement generated by the introduction of Visicalc, a few years back. It was said that Visicalc sold more Apples (the computer that is) than any other program, indeed people bought computers to run Visicalc.

From that original program sprang many look-alikes, all hoping for the same success. Usually they fell into two categories: emulations in Basic, which were slow and of dubious use; or more powerful machine code versions, which built up a following of users, on the machine. Similar offerings are now appearing for the BBC micro, some in ROM and others on tape or disc.

A spreadsheet program acts like a blank sheet of paper onto which text and numbers can be added, and from which calculations can be made, or entries altered. If several calculations make use of one entry then altering that entry will cause automatic recalculation of all the results. ROM spreadsheets come as a package containing the ROM; fitting instructions; a keyboard function overlay and manual.

Once the package is opened the ROM will need inserting into the sockets under your BBC keyboard. This isn't difficult provided instructions are followed exactly. With the chip in any of the sockets, the BBC micro can be switched on. If the chip has been placed in the rightmost socket, the machine powers up into the spreadsheet program.

If the ROM is fitted to the left of Basic, the BBC micro will power up into Basic as usual. With Beebcalc typing *BE or *BEEBCALC displays a copyright message followed by the front page menu:

1. Load Worksheet
2. Clear Worksheet
3. Save Worksheet
4. Full Hard Copy
5. Formulae Hard Copy

ESC Worksheet Display
Your choice—

At this point any command prefixed by a * will be passed to the operating system, so *CAT, etc, can be used. Otherwise, Beebcalc only reacts to the numbers 1,2,3,4,5 and the escape key.

Option 1 (load worksheet) causes Beebcalc to read in a sheet previously created with Beebcalc from whichever filing system is in operation: cassette, disc or Econet. After choosing this option the name of the file is requested. Any old memory contents are cleared and the new worksheet display automatically appears when all the data has been read in.

Option 2 (clear worksheet) instructs Beebcalc to forget any worksheet already in memory. If the user clears the worksheet by mistake, it can be recovered by pressing function key 5 (as described later).

Option 3 saves the worksheet in memory to the current filing system. The saving format is Beebcalc's own, and not compatible with other ROMs. My pre-release manual does, however, give details of the saving format for use with users' Basic programs.

Option 4 prints a complete record of what has been typed in order, showing formulae and box labels. This gives a paper back-up in the case of a data file being corrupt.

Option 5 (formulae hard copy) prints a list of formulae and boxes, to aid fault-finding.

Pressing escape at the front-page menu switches Beebcalc to its worksheet display mode (figure 1). The display is in two parts: the information lines, check, entry, message, and status ; and the blank workspace area below these lines. The check line shows the contents of whichever box the Beebcalc cursor is currently at. This alters as the cursor moves, and it can be switched off and on by pressing function key 1. The entry line is used for all keyboard entry to Beebcalc, while the message line gives warning of errors.

The fourth line, called status is extremely important as it indicates four points:

- the address of the box where the cursor is currently;
- the recalculation mode;
- direction of cursor movement after data entry;
- amount of memory remaining.

the first of these is self-explanatory. The 'recalculation mode' can be complicated as it seems, just read it as: Replicate right 4 (boxes) single box A5.

There are two other types of

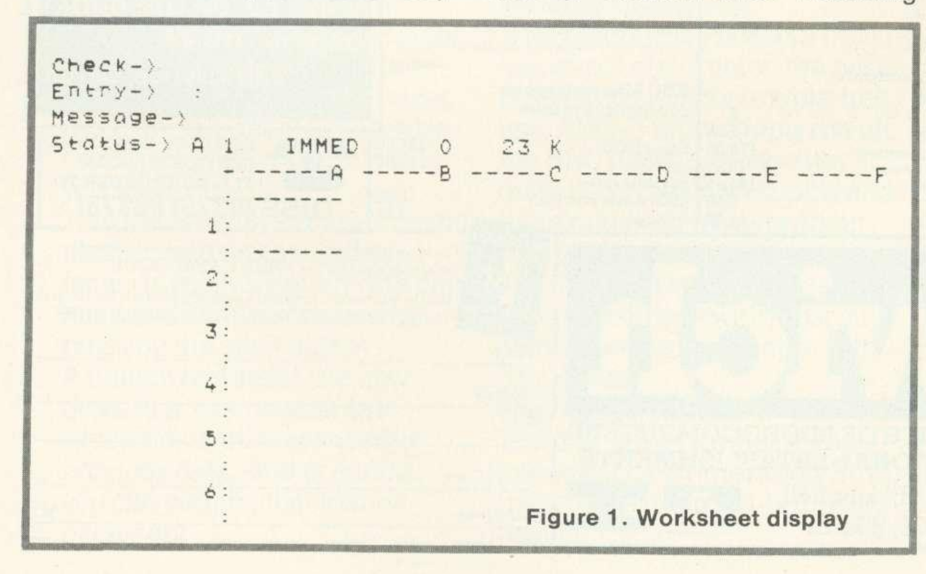


Figure 1. Worksheet display

either IMMEDiate or DEFERred, and function key 4 switches between these. IMMEDiate mode allows Beebcalc to recalculate all values on entry of each box, while the DEFERred mode will only recalculate after f4 is pressed. On large spreadsheets, there is a delay of a few seconds between recalculations, and the use of DEFERed mode will save time in entry. (I prefer to use IMMEDiate mode so I can see what happens at each stage.)

Function key 3 decides the direction in which the cursor moves after data entry. This is reflected by the letters O (off), R (right), or D (down) appearing on the status line. This is valuable for entering lists, from left to right or down the screen.

The amount of memory remaining is also shown on the status line. This is normally quite high while screen mode 7 is in use, but changing to mode 3 with f2 eats up 15k of memory. The manual suggests keeping at least 1k of spare memory.

The function keys all act only in display mode, and their overlay can be seen in figure 2. The edit key allows the check line contents to be edited using the BBC cursor keys. After editing, the contents of the check line will be entered into the current box.

Keys 1 to 4 have been mentioned, so moving to f5, we can recover an accidentally-deleted worksheet. Key 6 deletes the contents of the box under the cursor, while f7 moves the cursor to box A1, the 'home' position. Key 8 justifies numerical input to left or right of each box and f9 is not used.

Like its stablemate, Wordwise, Beebcalc can be learned, taught, and constructively used in 10 minutes, but it can be remarkably sophistitcated in the hands of an experienced user. The first simple example I tried is shown in figure 3,

Figure 2. Function key overlay

```
-------------------------------------------------------------------------------
! EDIT !  SHOW ! 40/80 !  AUTO ! UPDATE ! RECOVER ! DELETE ! MOVE !  L/R  !
!      !CONTENT!COLUMNS!STEP ON! ON/OFF !  SHEET  !   BOX  ! HOME !JUSTIFY!
-------------------------------------------------------------------------------
  f0     f1      f2      f3       f4        f5        f6      f7      f8
```



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and is suggested by the manual.

Once the display mode had been selected, I began filling in boxes by pressing f3 until the status line showed 'R' set up the auto step to move along the top line of the spreadsheet. Entering was simply a matter of typing a quotation mark followed by the text. For example * VAT then pressing return.

The manual recommends using spaces to position the word where required in the box. Each time the return key was pressed the cursor moved right, and when it reached the end of screen, the boxes all moved left! I was in fact able to move a window over the whole spreadsheet, from A to Z across the sheet and from 1 to 99 down the sheet, a total of 2,574 boxes. I returned HOME with f7, then entered the boxes down the left-hand side of the display, by setting the auto step to 'D' and typing in text as before. For items in columns B and C, I turned the auto step to '0' and entered the numerical values directly from the keyboard. For example, 2.4 then pressed return. Because the auto step was off, I moved between boxes with the cursor keys. Numbers were entered and displayed to two decimal places, though I later found it possible to alter the number of decimal places between 0 and 6.

Now I started to use the more powerful features of Beebcalc. I calculated the values of column D by entering a formula instead of numbers. A typical entry is shown in the check line of figure 3. Similarly for column E, I entered suitable formulae such as B3*C3+D3. Totalling column D was done by entering D2D3D4 into box D6. (Plus signs are not necessary for addition.) Similarly column E was totalled by E2E3E4 in box E6. Altering any entry in columns B or C was immediately reflected in columns D and E.

Beebcalc allows formulae to be written which may specify constants, or box numbers. These may be combined with any of the four rules of number: addition, subtraction, multiplication and division. The accuracy of any calculation is to six significant figures, or 1p in £10,000.

In addition to the menu and the commands of the function key overlay, Beebcalc has a number of useful commands which can be entered in display mode, from the keyboard, at any time. These are all prefixed by a '/' character (figure 4). Most powerful are the replication commands, which can copy the contents of any box or boxes, in any direction, over any number of boxes. A simple example is the method of drawing the dotted underline of figure 4. One line is entered at box A5:' ------ then the command string to replicate it is given: /RR4SA5. This isn't as

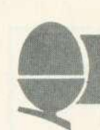
```
B3*C3*.15
:

A 1    IMMED      R   23 K
  -  -----A -----B -----C -----D -----E
  :
1: ITEM    UNIT P  QUANT     VAT  TOTAL
  :
2: MANUAL    1.95   1.00      .00  1.95
  :                        ------
3: CSSTTE     .66  20.00     1.98 15.18
  :                        ------
4: DISKS     2.40  10.00     3.60 27.60
  :
5:------------------------------------
  :
6: Amount:                   5.58 44.73
  :
```

Figure 3. Simple display

```
-------------------------------------------------------------
/U 7      Move cursor up 7 rows
/D 6      Move cursor down 6 rows
/M Q 12   Move the cursor to box Q 12
-------------------------------------------------------------
/W 10     Set box width to 10 characters throughout sheet.
/I        Show numbers as Integers. Calculate in decimal.
/. 4      Set 4 decimal places.
-------------------------------------------------------------
/O N 12   set printout width to N columns by 12 rows
/P A 1    Print sheet to /O specs, with A 1 at top left hand.
/S A 1    As /P but to disc or tape for use with Wordwise.
/T        Print any text following the /T command.
/^ 27,42  Output Ascii codes 27 and 42 to printer.
/` 35     Define character 35 as the pound sign.
-------------------------------------------------------------
```

Figure 4. Beebcalc commands



HOUSE 1				HOUSE 2			ROOM		DIFFERENCE	% LARGER
9.00	8.42	75.75	!	11.00	10.67	117.33	DINING		41.58	54.89
19.83	10.92	216.51	!	13.50	13.17	177.75	LOUNGE		-38.76	17.90
10.08	7.67	77.31	!	11.00	8.92	98.09	KITCHEN		20.78	26.88
.00	.00	.00	!	11.00	8.75	96.25	UTILITY	ROOM & WC	96.25	100.00
18.08	8.75	158.23	!	19.67	8.75	172.08	GARAGE		13.85	8.76
8.00	7.83	62.67	!	19.67	5.50	108.19	HALL		45.52	72.64
8.67	8.42	58.94	!	8.00	7.17	57.33	BATHROOM	AND WC	-1.61	2.73
12.08	11.00	132.92	!	14.25	11.92	169.86	BEDROOM	1	36.94	27.79
11.00	9.83	108.17	!	16.25	9.25	150.31	BEDROOM	2	42.15	38.96
8.17	8.00	49.33	!	11.58	10.25	118.73	BEDROOM	3	69.39	140.67
.00	.00	.00	!	8.75	7.75	67.81	BEDROOM	4	67.81	100.00
		939.82				1333.71			393.90	41.91

Figure 5. Floor space comparison

replication. Block type (replace the S by a B) which copies part of a row or column to another row or column. And incrementing type (replace S by I) which copies a single box into a series of boxes to right or left, changing the column references with each entry. This means a single totalling formula at the foot of one column could be replicated in each column along the sheet with just one command.

Over the past couple of months I have experimented with a number of datafiles, and have checked Beebcalc for robustness. It's bug-free, but slows down dramatically with large mode 3 sheets. The field of applications which would benefit in some way from spreadsheets are numerous. Education is one but home users and small businesses will find sheets provide an inexpensive way of handling structured calculations, for finance, planning, measuring, and any situation requiring numerical modelling. I include figures 5 and 6 which demonstrate in Beebcalc real and useful applications, one for the home and one for the businessman.

The manual is produced by Computer Concepts, and has over 32 pages of detailed information. It improves on my Wordwise manual by having a simple, structured section on using Beebcalc, covers all the commands and details how to apply the file format to your own programs. However, it is vital entries are made in the correct order, as in the manual, or error messages will confuse the inexperienced.

Beebgraph is a long utility program written by Rob Pickering. Its aim is to display data from one row or column of Beebcalc as a pie chart, bar graph, or frequency diagram. Beebgraph is easy to use providing the instructions are followed exactly, and the appropriate section of the manual is used, Beebgraph can be copied to disc, for users with DFS.

Things I like about BEEBCALC are: comprehensive instructions and support package; speed at which it can be learned and used constructively; facilities for printing, filing, and accessing Beebcalc files from user programs; and a large range of useful commands. Worth noting is the use of 'wild cards'; @ for current column letter, eg @2@3 means add boxes 2 and 3 in the current column, and ? for current row number, eg A?B? means add boxes A and B in the current row.

However, Beebcalc falls short on several important points. First, I would have preferred a wider range of mathematical operations, including trig, exponential, log, etc, and would find macro commands for statistical use valuable, eg correlations and standard deviation. Second, although the spreadsheet has a range of 26 × 99 boxes, only 18 can be totalled at a time.

Other dislikes are that the range of six significant figures is small. I would prefer a minimum of 10, with a command for rounding off. Column widths should be selectively alterable, for example column A could be six characters wide, while column B might be set to 10.

In conclusion, Beebcalc must be regarded as a useful, though limited, package, and is not up to the standard set by Wordwise. It is a good introduction to spreadsheets, but users will soon realise its limitations. ViewSheet might be a better bet for old-timers, and Computer Concepts is understood to be developing an upgraded Beebcalc, for which I am reserving a ROM socket.

Beebcalc is produced and marketed at approx £40 including VAT, by Computer Concepts, 16 Wayside, Chipperfield, Herts.

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NO 3	207.00	6.20	11.00	4.00	15.00	33.40	7.25
NO 4	317.00	8.72	15.00	5.12	20.12	36.35	6.35
SubT1	993.00	28.52	50.10	19.92	70.02	34.82	7.05
NO 5	311.00	8.58	15.00	.00	15.00	36.24	4.82
NO 6	294.00	8.55	15.00	.00	15.00	34.39	5.10
NO 7	286.00	8.64	15.80	.00	15.80	33.11	5.52
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Figure 6. Car information sheet

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Susan Stepney introduces some intriguing shapes produced by simple programs

INCREDIBLE FRACTALS

There is more to certain simple equations than meets the eye – and fractal curves provide an amazing example of this. Theoretically, some lines can become planes – fractals lie inbetween the two! The theory may sound complex, but the programming is simple, and the resulting graphics very unusual. So don't let the maths put you off. Just type in the listings, sit back and watch.

FRACTALS are curves with a difference, because no matter how much you magnify a given piece of a fractal, it never looks smooth, there is always detail. In fact, their length depends on the length of the ruler used to measure them!

This is analogous to the old question of how long is the coastline of Britain? With each decrease in the length of the 'ruler' used, the coastline grows as ever smaller details from bays to pebbles, even down to grains of sand are measured. In the physical world this breaks down eventually – matter (probably) does not have structure on infinitely many scales. However, a *mathematical* fractal curve can, and does, have structure on all scales. As your ruler gets shorter, so you can measure finer detail, and the curve gets longer. Eventually it has an infinite length. Some 'lines' can be constructed (in principle) which pass through *every* point of a plane, and so are two-dimensional! These 'space-filling curves' are an extreme – the fractals in this article are more than lines but not two-dimensional.

The study of fractals was developed by Benoit Mandelbrot. His book *The Fractal Geometry of Nature* (published by Freeman) touches on many points, but is notable for its marvellous illustrations, all computer generated. While some are, at present, beyond the BBC micro, many are straightforward.

A variety of graphic displays can be obtained from one equation:

$$z_{n+1} = Az_n(1-z_n)$$

It looks innocuous, but this equation conceals a very rich structure. If you don't want to bother with the maths, don't worry. Just type in the listings and produce the pictures. For those of you who are interested, read on.

Consider the simplest case, when z and A are both real (see figure 1 for introduction to complex maths). The first question is, given a value of A and an initial 'seed', z_0, does z_n settle down to a steady value as n gets large, does it diverge, or does it do something else? The answer does not depend on the seed, if it lies between 0 and 1. It is, however, very sensitive to the choice of A. (Assume A is greater than 0. You might like to investigate negative values.)

Run program 1 for Ainit =1. This produces a plot of A along the horizontal axis, (from Ainit to 4) and the corresponding z up the vertical axis. For A less than 3, z settles down to a value of 1-(1/A) after a few steps. Then the surprises start. As A increases above 3, the curve of z against A splits in two; there are now two values between which z hops back and forth. As A is increased further, the curve splits again, and z hops among four values. These splits happen more and more quickly, until, at A ≃ 3.57 the sequence of z's becomes chaotic – z hops among infinitely many numbers between 0 and 1. The story is not over, however. Increase A further, and islands of order appear in this sea of chaos. For example, when A ≃ 3.8284, z

Figure 1

THE complex number z has a real part z_r and an imaginary part z_i, and is written as $z = s_r + iz_i$, where $i^2 = -1$. Complex numbers can be subtracted, multiplied and divided in the same way as real numbers, provided that every time i^2 appears it is replaced by −1. So, for the complex numbers x and y:

$$x \pm y = (x_r \pm y_r) + i(x_i \pm y_i)$$

$$xy = (x_r + ix_i)(y_r + iy_i)$$

$$= (x_r y_r - x_i y_i) + i(x_r y_i + x_i y_r)$$

$$x/y = \frac{x_r + ix_i}{y_r + iy_i} = \frac{(x_r + ix_i)(y_r - iy_i)}{(y_r + iy_i)(y_r - iy_i)}$$

$$= \frac{x_r y_r + x_i y_i + i(x_i y_r - x_r y_i)}{y_r^2 + y_i^2}$$

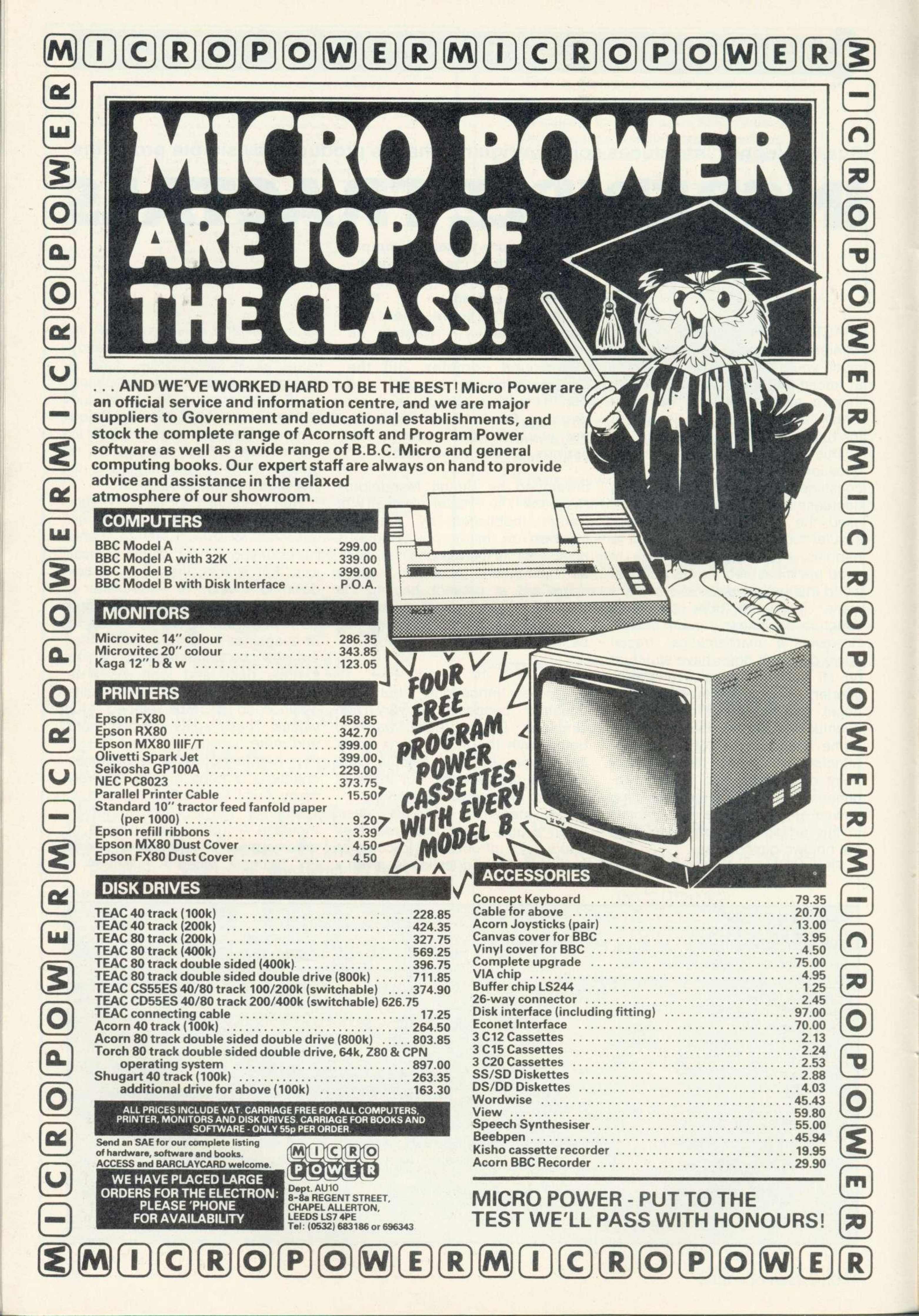
Complex numbers can be plotted on a two-dimensional plane called an Argand diagram. The usual x-axis becomes the 'real' axis, and the y-axis the 'imaginary' axis. Then the complex numbers $z = z_r + iz_i$ can be plotted as if it were an ordinary point with Cartesian co-ordinates (z_r, z_i). Another way of labelling its position is by polar co-ordinates (r,θ). Here, r is the length of the line drawn between (0,0) and z, and θ is the angle between this line and the real axis. Trigonometry then gives

$$z_r = r\cos\theta$$
$$z_i = r\sin\theta$$

And

$$z = r(\cos\theta + i\sin\theta)$$

This way of writing complex numbers makes it much simpler to take square roots. If z = [r,θ], then $\sqrt{z} = (\sqrt{r}, \theta/2)$.



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suddenly starts hopping between just three values. These islands show very clearly in figure 2. Another way of studying this is by program 2, which enables you to hear the values of z. A note with pitch proportional to z is sounded as z increases. A value of A = 3.2 gives a cycle of two notes (after a few iterations to converge). A = 3.5 gives four notes. Chaos is demonstrated by A = 3.8, and the three-note cycle can be heard when A = 3.83.

When A is greater than 4 the behaviour depends also on the seed. The sequence diverges to ∞ for most values of the seed but not all. To find the non-divergent seeds we start with a finite z_∞ and work backwards to find the z's which give this. Reversing our original equation gives:

$$z'_{n+1} = (1 \pm \sqrt{1 - 4z'_n/A})/2$$

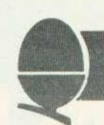
But which square root do we take? Since we do not know, the sign is chosen randomly at each step. Figure 3 shows the 'theatre curtain' produced by program 3. The curtain can be made less 'moth-eaten' by increasing the number of iterations at each value of A, but this makes the program even slower. The value 4/A is plotted down the vertical axis, (so A goes from 4 at the top of the screen to infinity at the bottom), and the corresponding non-divergent z's along the horizontal axis. The pattern is a 'dust' of unconnected points. (Fatou, see Mandelbrot's book, proved the central shape is a parabola, in 1906!)

So even the simple case with real z and A has an unexpectedly rich structure. Now let first z, then A, become complex. We are still interested in the reverse process, finding those values of z which do not diverge for a given A. So we still use equation 2, but the complex

```
 10 REM *************
 20 REM * PROGRAM 1 *
 30 REM *************
 40 REM
 50 MODE1
 60 INPUT"MODE 0,1 or 2 ? " M%:IF M%>2 M%=2
 70 INPUT"Initial A   1 < A < 4  ? " Ainit:
    IF Ainit<1 Ainit=1
 80 PRINT"maximum A    ";Ainit;:INPUT" < A <
    4  ? " Amax:IF Amax<Ainit Amax=4
 90 MODE M%
100 VDU23,1,0;0;0;0; :REM turn off cursor
110 step% = 2^(M%+1) :REM step size depends
    on MODE
120 scale=(Amax-Ainit)/1280 :REM scale hori
    zontal axis
130 z=RND(1) :REM initial value z0
140 FOR X%=0 TO 1279 STEP step%
150 A=X%*scale+Ainit
160 IF A<2.95 cycle%=2 ELSE cycle%=20 :REM
    few steps needed before 3
170 FOR Y%=1 TO cycle%:z=A*z*(1-z):NEXT Y%
    :REM iterations to converge
180 FOR Y%=1 TO cycle%
190 z=A*z*(1-z)
200 Z%=z*1023:PLOT 69,X%,Z%
210 NEXT Y%
220 NEXT X%
230 VDU23,1,1;0;0;0; :REM turn on cursor
240 END
```

Program 1.

Figure 2. The result of running program 1 with Ainit=2, Amax=4. The strip in the chaotic region that has few dots in it shows the values of A for which zn hops between three values.




```
  1Ø REM *********
  2Ø REM * SOUND *
  3Ø REM *********
  4Ø REM
  5Ø ON ERROR GOTO 6Ø
  6Ø INPUT "A  [3.5]  "A:IF A=Ø A=3.5
  7Ø INPUT "Duration of note [1]  "tim
     e%:IF time%=Ø time%=1
  8Ø z=RND(1)
  9Ø REPEAT
 1ØØ z=A*z*(1-z)
 11Ø SOUND 1,-1Ø,z*255,time%
 12Ø UNTIL FALSE
 13Ø END
```

Program 2.

```
  1Ø REM ***********
  2Ø REM * CURTAIN *
  3Ø REM ***********
  4Ø REM
  5Ø MODEØ
  6Ø VDU23,1,Ø;Ø;Ø;Ø; :REM turn off cu
     rsor
  7Ø z=RND(1) :REM seed zØ
  8Ø FOR J%=1Ø23 TO Ø STEP -4
  9Ø R=J%*2.4414Ø625E-4 :REM R=4/A
 1ØØ FOR K%=Ø TO J%*Ø.1+2 :REM fewer s
     teps required for small J%
 11Ø z=Ø.5+SGN(RND)*SQR(Ø.25-z*R)
 12Ø I%=z*1279:PLOT69,I%,J%
 13Ø I%=1279-I%:PLOT69,I%,J% :REM use
     symmetry of the curtain
 14Ø NEXT K%
 15Ø NEXT J%
 16Ø END
```

Program 3.

Figure 3. 'Theatre curtain' produced by program 3

arithmetic must be done explicitly (program 4).

Unlike the case of the dust, we cannot plot the appropriate values of z for all values of A simultaneously. Since z is now complex, a two-dimensional plot of the imaginary part against the real part of z (called an Argand diagram) is needed for each A. The program uses the fact that these plots are all centred on z =1/2 and have reflectional symmetry in the vertical and horizontal directions. Four points can thus be plotted each iteration.

The resulting curves for some values of A are shown in figure 3 (try A = 2 – one of he more bizarre ways of producing this shape!). The curves are in fact closed, although in the figures they appear to be disconnected, since some parts take a long time to fill in.

What happens if A is complex? Again, we consider the backwards mapping, and a small extension to program 4, shown as program 5, does the trick. Now we have to specify both the real and imaginary parts of A. (The previous case corresponds to Im(A) = 0.) The results are shown in figure 5. They have similar outlines to those for real A, but are more filled in as they have a larger dimension. They are fascinating to watch 'grow' on the screen. Since some regions fill very slowly sometimes nothing appears to be happening as points are being plotted over. Then suddenly a 'burst' of points appear.

Note there are *two* random number generators to choose the sign of the square root, ie, the root chosen can be different for the real and imaginary parts of z'_n. Initially, only one random number was used; after all, there is only one square root in the second equation. This resulted in some interesting pictures, one of which is shown in figure 6. Closer consideration of the second equation shows there are two roots, so two random numbers are required. Still, the pictures are no less interesting just because they are *not* the solution. They also show a property of these fractals, called 'self-similarity' – looking on smaller scales does not change the appearance of the solution. 'Fern' strikingly illustrates this – each 'frond' is just a small copy of the whole fern, as is each frond of that frond . . .

Why are these pictures so appealing? I think it is because our eyes are adapted to looking at fractals such as skylines, outlines of trees and coastlines – an idea borne out by some of the pictures in Mandelbrot's book. He has produced some artificial fractal coastlines and landscapes of different fractal dimension (d). For some choices of d, very convincing maps are produced. Other, slightly different, dimensions give much less convincing plots – the eye rejects them as either too smooth or too ragged.

Finally, you might like to experiment with another equation:

$$z_{n+1} = A|1-z_n|$$
$$z'_{n+1} = 1 \pm z'_n/A$$

The patterns are quite different, but still interesting, especially in the case of imaginary z and A. Also, since they do not involve square roots, the programs run slightly faster.



```
   1 REM **********************
   2 REM * REAL A, COMPLEX Z *
   3 REM **********************
   4 REM
  1Ø REz=Ø:IMz=Ø :REM seed zØ
  2Ø MODEØ
  3Ø INPUT"A  [3] "A:IF A=Ø A=3
  4Ø INPUT "x scaling [1ØØØ] "S%:IF S%
     =Ø S%=1ØØØ
  5Ø INPUT"relative magnification in y
     [1]  "S2%:IF S2%=Ø S2%=1
  6Ø MODEØ:VDU29,64Ø;512; :REM move gr
     aphics origin
  7Ø VDU23,1,Ø;Ø;Ø;Ø; :REM switch off
     cursor
  8Ø ON ERROR GOTO 27Ø :REM press ESCA
     PE to finish
  9Ø I%=Ø :REM I% counts the iteration
     s
 1ØØ IA=4/A
 11Ø REPEAT
 12Ø I%=I%+1
 13Ø var1=1-REz*IA:var2=IMz*IA
 14Ø R=SQR(var1*var1+var2*var2)
 15Ø CS=var1/R
 16Ø var3=R*(1+CS)*Ø.5:IF var3<Ø var3=
     Ø
 17Ø REy=SQR(var3)
 18Ø var3=R*(1-CS)*Ø.5:IF var3<Ø var3=
     Ø
 19Ø IMy=SQR(var3)
 2ØØ S=SGN(RND)
 21Ø REz=Ø.5+S*Ø.5*REy
 22Ø S=SGN(RND)
 23Ø IMz=S*Ø.5*IMy
 24Ø X%=(REz-Ø.5)*S%:Y%=IMz*S%*S2%
 25Ø PLOT69,X%,Y%:PLOT69,-X%,Y%:PLOT69
     ,X%,-Y%:PLOT69,-X%,-Y%
 26Ø UNTIL FALSE
 27Ø PRINTTAB(Ø,Ø)"A = ";A:PRINTTAB(5Ø
     ,Ø)"magnification = ";S%
 28Ø PRINTTAB(Ø,1)I%;" iterations":PRI
     NTTAB(5Ø,1)"y magnification = ";S2%
 29Ø END
```

Program 4.

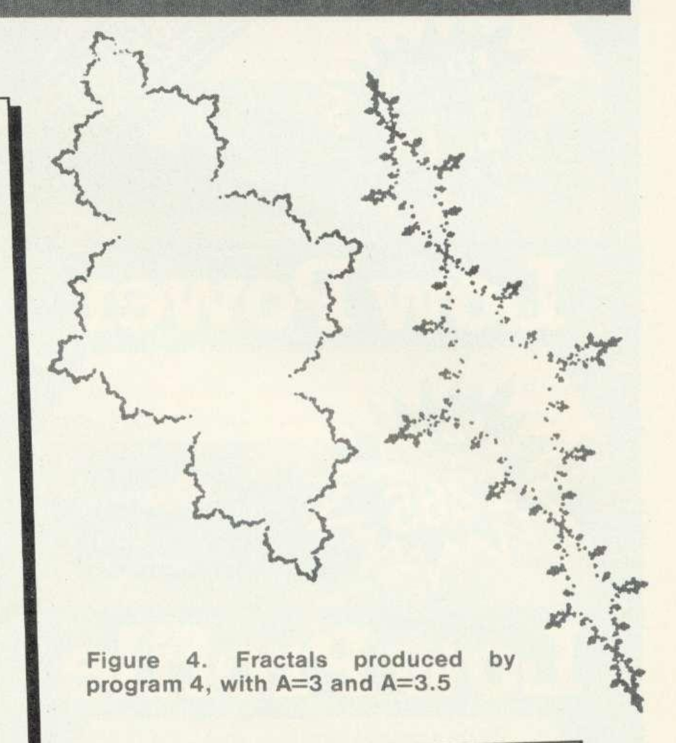


Figure 4. Fractals produced by program 4, with A=3 and A=3.5

```
  1Ø REM ******************
  2Ø REM * COMPLEX A and Z *
  3Ø REM ******************
  4Ø REM
  5Ø REz=Ø:IMz=Ø :REM seed zØ
  6Ø INPUT"Scale [1ØØØ]  "S%:IF S%=Ø S
     %=1ØØØ
  7Ø INPUT"Real part of A  "REA$:REA=E
     VAL(REA$)
  8Ø INPUT"Imaginary part  "IMA$:IMA=E
     VAL(IMA$)
  9Ø MODEØ
 1ØØ VDU29,64Ø;512;:VDU23,1,Ø;Ø;Ø;Ø;
 11Ø ON ERROR GOTO 31Ø
 12Ø I%=Ø
 13Ø AMOD=REA*REA+IMA*IMA
 14Ø IA=4/AMOD
 15Ø REPEAT
 16Ø I%=I%+1
 17Ø var1=1-(REz*REA+IMz*IMA)*IA
 18Ø var2=(IMA*REz-IMz*REA)*IA
 19Ø R=SQR(var1*var1+var2*var2)
 2ØØ CS=var1/R
 21Ø REy=SQR(R*(1+CS)*Ø.5)
 22Ø IMy=R*(1-CS)*Ø.5:IF IMy<Ø IMy=Ø
 23Ø IMy=SQR(IMy)
 24Ø S=SGN(RND)
 25Ø REz=Ø.5+S*Ø.5*REy
 26Ø S=SGN(RND)
 27Ø IMz=S*Ø.5*IMy
 28Ø X%=(REz-Ø.5)*S%:Y%=IMz*S%
 29Ø PLOT69,X%,Y%:PLOT69,-X%,Y%:PLOT69
     ,X%,-Y%:PLOT69,-X%,-Y%
 3ØØ UNTIL FALSE
 31Ø PRINTTAB(Ø,Ø);I%;" iterations":PR
     INTTAB(4Ø,Ø)"scale = ";S%
 32Ø PRINTTAB(Ø,1);"A = ";REA;" + ";IM
     A;" i  =  ";REA$;" + ";IMA$;" i"
 33Ø END
```

Program 5

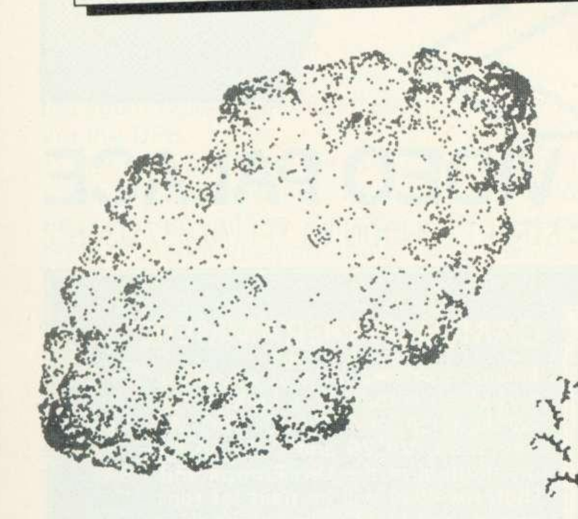


Figure 5. Fractal produced by program 5, with the real part of A = 3, the imaginary part of A = 0.5 (ie A =3 + i/2)

Figure 6. 'Fern' – the top right-hand quarter of the picture produced by program 5 when the random sign generator, line 260, is deleted. Here A = (1–i)/√2



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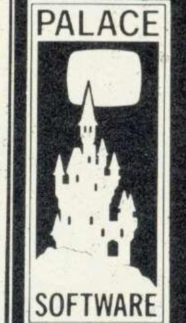
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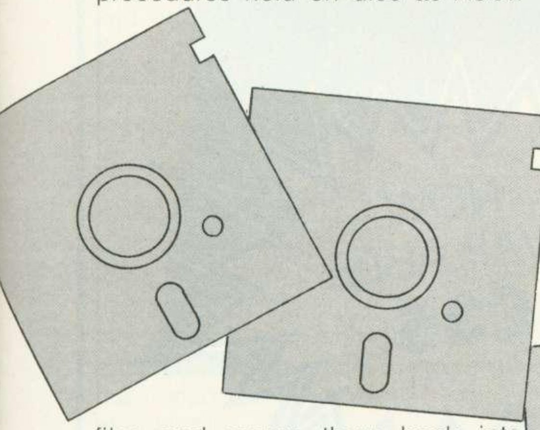


57-FILE CATALOGUE

Nigel Pendleton produces a way of storing more than 31 files per disc. The technique creates two catalogues per disc and works on both 80-track and 40-track discs

A MAJOR restriction with the BBC disc system is the limitation of 31 files per catalogue. To fill a disc on a 40 track system, files must be just over 3k each on average. This is probably below par for most programs and data files, but many disc users will find themselves saving every program – even short routines – as they are written.

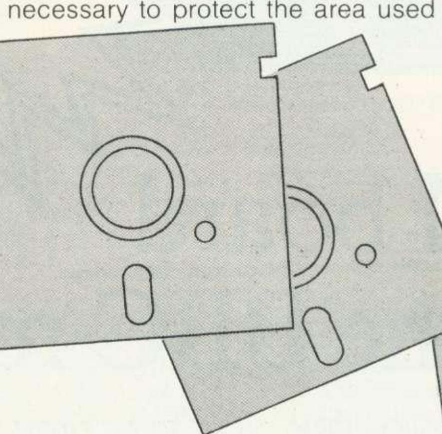
One example is using the Beeb's ability to write a library of procedures held on disc as ASCII files and merge them back into programs as required. The idea of a disc full of procedures on line, ready to slot into programs sounded too good to be true. And it was, as a full disc contained only 8 or 9k on a drive that boasted 200k of storage!



The obvious way of creating more than 31 files would be to extend the catalogue to accept more entries. This, however, does not seem possible without redesigning the DFS.

The catalogue on the BBC DFS uses the first two sectors on the disc (set up during formatting) to hold all the information about every file. Another approach would be to create a second catalogue on the disc and switch between the two, giving twice the number of entries, and the ability to save programs under two separate categories. All this with the loss of only three sectors (less than 1k) of disk space. (Two sectors for the second catalogue and one for the utility program 'ALT'.)

It is obviously important that one catalogue does not overwrite an area of the disc the other has used to store a file. The method used to overcome this involves 'fooling' one of the catalogues (CATA) into believing it is only a 40-track disc (therefore it will only use tracks 0-39) and saving a dummy program to the other catalogue (CATB) of 400 sectors (therefore only using tracks 40-79). Thus they should never clash (providing the dummy program is never deleted). It is also necessary to protect the area used to store the second catalogue from overwriting by both CATA and CATB. This is done by creating another dummy file on both catalogues. The only other necessity is a utility program (ALT) which, when called, will switch catalogues. ALT is only stored once, but both CATA and CATB can access it.

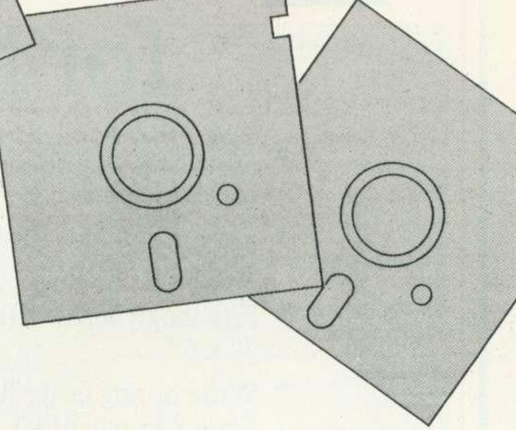


When run, program 1 will create dual catalogues on an 80-track disc, write the dummy programs as described above and save a copy of 'ALT' to perform the switch.

To use the program, type it in as shown (ignoring comments and REM statements if required), and, after saving a copy, insert a freshly-formatted disc in the drive (it must be formatted, but not contain any files). Run the program and when prompted enter the drive number containing the disc to be modified. The program will do the rest, writing the necessary files to the disc.

When the program is finished, type *CAT and see the present catalogue (CATA) with the utility program ALT and the dummy program Z.Z. all present and locked. Typing *ALT will cause the utility program to switch catalogues: typing *CAT will cause (the now present catalogue) CATB to be displayed. This time you will notice two dummy programs Z.Z and Z.ZZ along with the utility program (again all locked). It is now simply a matter of typing *ALT at any time – even from within a program – to switch catalogues, allowing a total of 57 separate files to be written to the disc (29 in CATA + 28 in CATB).

The program has been thoroughly tested, and all the DFS commands work as normal on whichever catalogue is in use (remember though, that creating a back-up of a dual catalogue disc will create an identical disc along with both catalogues and full facilities). It is even possible to open a file on one catalogue, switch catalogues and open another file on the other catalogue – once opened, files can be read or written to at any time – under either catalogue. However, it is important that the correct catalogue is selected before closing a file or a 'disc changed' error message will result.



The program should be fairly easy to understand, using procedures containing the assembler

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source for the three machine code subroutines. It is worth pointing out the reason for positioning the buffers. Buffer 1 (BUF1) could be anywhere in memory, but I have chosen to use the RS432 buffers. Using *ALT will corrupt these buffers, so anyone using the RS432 port should allocate another space for BUF1 (line 70).

BUF2 is more dependant on location as this is where the DFS, when accessing a disc, stores the catalogue. The DFS does not re-load the catalogue before using it if the drive has not stopped since the last access. Therefore, as the program accesses the disc several times without the drive stopping – and changes the catalogue during this operation –it is necessary to ensure the correct catalogue is in the buffer at all times. As long as the address of BUF2 is not altered, there will be no problems. The machine code programs, including ALT, are all written into the user-defined character buffer. Again *ALT will corrupt any user-defined characters in the buffer at the time of calling. If this is not acceptable, another location must be used – the machine code is totally relocatable.

Figure 1 gives a brief description of what the various lines and procedures do. Note also the changes to program 1 for 40-track drives.

Program 1.
To use on 40-track drives, change these lines

```
 220 *SAVE Z.ZZ 0000 C300

1060 LDA #&00:STA BUF1*256+256+6

1070 LDA #&C8:STA BUF1*256+256+7

  10 REM    Program to create dual
  20 REM catalogues on 80 track disks
  30 REM
  40 REM COPYRIGHT 1983 N. Pendleton
  50 REM
  60 INST=&0CD0
  70 BUF1=&09
  80 BUF2=&0E
  90 OSWORD=&FFF1
 100 REPEAT
 110   INPUT'''"Which drive? "DRV
 120   UNTIL DRV<4 AND DRV>-1
 130 ?&10CB=DRV
 140 *SAVE Z.Z 0000 0200
 150 *ACCESS Z.Z L
 160 FORPASS=0TO2STEP2
 170   P%=&0C00
 180   PROCALT
 190   NEXTPASS
 200 *SAVE ALT 0C00 0CFF
 210 *ACCESS ALT L
 220 *SAVE Z.ZZ 0000 18B00
 230 *ACCESS Z.ZZ L
 240 FORPASS=0TO2STEP2
 250   P%=&0C00
 260   PROCCOPYCAT
 270   NEXTPASS
 280 CALL&0C00
 290 *ACCESS Z.ZZ
 300 *DELETE Z.ZZ
 310 FORPASS=0TO2STEP2
 320   P%=&0C00
 330   PROCFOOL
 340   NEXTPASS
 350 CALL&0C00
```

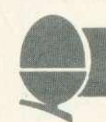
listing continued page 49 ▶

60–90	Set up variables used within the assembler
100–120	Prompt and input the drive number
130	Sets the drive number, has the same effect as using *DRIVE n
140–150	Saves dummy Z.Z and locks it
160–190	Execute two-pass assembly of ALT
200–210	Saves ALT, and locks it
220–230	Saves second dummy Z.ZZ and locks it
240–270	Execute two-pass assembly of COPYCAT
280	Calls machine code routine COPYCAT which duplicates the catalogue on sectors 2 and 3
290–300	Unlocks dummy file Z.ZZ and deletes it. This dummy is only required on CATB and as the present catalogue is CATA, CATB is unaffected
310–340	Execute two-pass assembly of FOOL
350	Calls machine code routine FOOL which makes the current catalogue think the disc is only formatted to 40 tracks thereby preventing access to tracks 40–79

Here's an overall outline of the assembler listings.

PROC-OPYCAT	This will copy the discs catalogue to sectors 2 and 3 of track 0
400–520	Set up the instruction block which, when calling OSWORD with A=&7F, X=MSB address of instruction block, and Y=LSB address of instruction block, will cause sectors 0 and 1 of track 0 to be read into buffer 2
530–570	As above, but this time causes the data in buffer 2 to be written to sectors 2 and 3 of track 0, thereby creating a copy of the existing catalogue
PROC-ALT	Assembly version of the utility that, when assembled and written to the disc, will cause switching of the two catalogues when called
630–750	Cause sectors 0 and 1 of track 0 (the catalogue) to be read into buffer 1
760–790	Cause sectors 2 and 3 of track 0 (the alternate catalogue) to be read into buffer 2
800–830	Store the previously-read catalogue as the alternate catalogue
840–870	Write the previously-read alternate catalogue into the catalogue sectors
PROC-FOOL	Assembly version of the program to convert a catalogue formatted as 80-track into a 40-track catalogue
930–1050	Read the catalogue into buffer 1
1060–1070	Change the bytes containing the number of tracks
1080–1110	Write the amended catalogue back to disc

Figure 1. Outline of program 1, with comments on lines



▶ page 47

```
360 END
370 REM------------
380 DEFPROCCOPYCAT
390 REM------------

400 [OPTPASS                          \ SET UP INSTRUCTION BLOCK
410 LDA #DRV:STA INST                 \ DRIVE NUMBER
420 LDA #0                            \ INITIALISE ADDRESS OF
430 STA INST+1:STA INST+2             \ BUFFERS TO
440 STA INST+3:STA INST+4             \ ZERO
450 LDA #3:STA INST+5                 \ NUMBER OF PARAMETERS (3)
460 LDA #&22:STA INST +9              \ 2 SECTORS, EACH 256 BYTES
470 LDA #BUF2:STA INST+2              \ SET BUFFER ADDRESS
480 LDA #0:STA INST +7                \ TRACK NUMBER (0)
490 STA INST+8                        \ SECTOR NUMBER (0)
500 LDA #&53:STA INST+6               \ COMMAND - READ SECTORS
510 LDA #&7F:LDX #INST MOD256 \ SET XY REGISTERS TO POINT TO INSTRUCTION
520 LDY #INST DIV256:JSR OSWORD\ BLOCK, A TO &7F, THEN CALL OSWORD
530 LDA #BUF2:STA INST+2              \ BUFFER ADDRESS
540 LDA #&4B:STA INST+6               \ COMMAND - WRITE TO SECTORS
550 LDA #2:STA INST+8                 \ SECTOR NUMBER
560 LDA #&7F:LDX #INST MOD256 \ SET XY REGISTERS TO POINT TO INSTRUCTION
570 LDY #INST DIV256:JSR OSWORD\ BLOCK, A TO &7F, THEN CALL OSWORD
580 RTS:]
590 ENDPROC

600 REM-------
610 DEFPROCALT
620 REM-------

630 [OPTPASS                          \ SET UP INSTRUCTION BLOCK
640 LDA #DRV:STA INST                 \ DRIVE NUMBER
650 LDA #0                            \ INITIALISE ADDRESS OF
660 STA INST+1:STA INST+2             \ BUFFERS TO
670 STA INST+3:STA INST+4             \ ZERO
680 LDA #3:STA INST+5                 \ NUMBER OF PARAMETERS (3)
690 LDA #&22:STA INST +9              \ 2 SECTORS, EACH 256 BYTES
700 LDA #BUF1:STA INST+2              \ SET BUFFER ADDRESS
710 LDA #0:STA INST +7                \ TRACK NUMBER (0)
720 STA INST+8                        \ SECTOR NUMBER (0)
730 LDA #&53:STA INST+6               \ COMMAND - READ FROM SECTORS
740 LDA #&7F:LDX #INST MOD256 \ SET XY REGISTERS TO POINT TO INSTRUCTION
750 LDY #INST DIV256:JSR OSWORD\ BLOCK, A TO &7F, THEN CALL OSWORD
760 LDA #BUF2:STA INST+2              \ SET BUFFER ADDRESS
770 LDA #2:STA INST+8                 \ SECTOR NUMBER (2)
780 LDA #&7F:LDX #INST MOD256 \ SET XY REGISTERS TO POINT TO INSTRUCTION
790 LDY #INST DIV256:JSR OSWORD\ BLOCK, A TO &7F, THEN CALL OSWORD
800 LDA #BUF1:STA INST+2              \ SET BUFFER ADDRESS
810 LDA #&4B:STA INST+6               \ COMMAND - WRITE TO SECTORS
820 LDA #&7F:LDX #INST MOD256 \ SET XY REGISTERS TO POINT TO INSTRUCTION
830 LDY #INST DIV256:JSR OSWORD\ BLOCK, A TO &7F, THEN CALL OSWORD
840 LDA #BUF2:STA INST+2              \ SET BUFFER ADDRESS
850 LDA #0:STA INST+8                 \ SECTOR NUMBER (0)
860 LDA #&7F:LDX #INST MOD256 \ SET XY REGISTERS TO POINT TO INSTRUCTION
870 LDY #INST DIV256:JSR OSWORD\ BLOCK, A TO &7F, THEN CALL OSWORD
```

listing continued page 50▶



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```
 880 RTS:]
 890 ENDPROC
 900 REM----------
 910 DEFPROCFOOL
 920 REM----------
 930 [OPTPASS                   \ SET UP INSTRUCTION BLOCK
 940 LDA #DRV:STA INST          \ DRIVE NUMBER
 950 LDA #0                     \ INITIALISE ADDRESS OF
 960 STA INST+1:STA INST+2      \ BUFFERS TO
 970 STA INST+3:STA INST+4      \ ZERO
 980 LDA #3:STA INST+5          \ NUMBER OF PARAMETERS
 990 LDA #&22:STA INST +9       \ 2 SECTORS, EACH 256 BYTES
1000 LDA #BUF1:STA INST+2       \ SET BUFFER ADDRESS
1010 LDA #0:STA INST +7         \ TRACK NUMBER (0)
1020 STA INST+8                 \ SECTOR NUMBER (0)
1030 LDA #&53:STA INST+6        \ COMMAND - READ FROM SECTORS
1040 LDA #&7F:LDX #INST MOD256  \ SET XY REGISTERS TO POINT TO INSTRUCTION
1050 LDY #INST DIV256:JSR OSWORD\ BLOCK, A TO &7F, THEN CALL OSWORD
1060 LDA #&01:STA BUF1*256+256+6\ CHANGE THE BYTES IN THE CATALOGUE
1070 LDA #&90:STA BUF1*256+256+7\ WHICH INDICATE THE NUMBER OF TRACKS
1080 LDA #BUF1:STA INST+2       \ SET BUFFER ADDRESS
1090 LDA #&4B:STA INST+6        \ COMMAND - WRITE TO SECTORS
1100 LDA #&7F:LDX #INST MOD256  \ SET XY REGISTERS TO POINT TO INSTRUCTION
1110 LDY #INST DIV256:JSR OSWORD\ BLOCK, A TO &7F, THEN CALL OSWORD
1120 RTS:]
1130 ENDPROC
```



IAN BIRNBAUM will answer reader's questions in this column and develop their ideas – as well as giving some of his own. But the real aim is for readers to provide the questions and answers. At least £5 will be paid for any tip published, with £10 for those which merit a one-star award and £20 for real humdingers! The idea must be original and be described clearly and fully.

Your contribution should be typed or printed, with any substantial listings on cassette, but only included to make a point.

£10 SAVING BASIC AS MACHINE CODE by A. Oliver

WITH disc-based systems a program can be called by name provided it is in the currently-selected library. There is one catch – the said program must be in machine code, ie, *FORMAT is equivalent to *RUN FORMAT.

Now it would be nice if the same syntax could be used for Basic programs, and there is a way. Type in program 1 noting that there must be at least 26 spaces between the quotes in line 0, and no space before the REM or the first quotes. When run this program assembles machine code in the memory occupied by the spaces in line 0.

The machine code uses an OSBYTE call with A% = 138 to put RUN<CR> into the input buffer. Now try CALL &1906 and the program will run. So if line 0 is included in any Basic program it can be saved as machine-code. Then, *RUN with the execution address as &1906 will be equivalent to Basic's CHAIN.

You may be wondering why in lines 120-130 Y is loaded with #14 and then decremented rather than being loaded with 13 immediately. The reason is that the Basic interpreter reacts rather badly to carriage returns (ASCII 13) in REM statements. There is still one snag: since line 0 contains a control character (ASCII 14), this will be lost in text files. Thus *SPOOL & *EXEC are of no use here.

So the routine is as follows. Enter the listing, run it and check it works with CALL & 1906. Now delete lines 10-160 and save line 0 for future use. Next find the value of TOP-2 and *LOAD your Basic program at this address. Line 0 is now merged into your program. Find TOP and *SAVE the lot; eg, if TOP is xxxx;

*SAVE <fsp> 1900 xxxx 1906 1900

Now you will find that *<fsp> will effectively chain your Basic program (provided of course *LIB is set to the correct drive and directory).

```
 0REM"                          "
 10 FOR I% = 0 TO 3 STEP 3
 20   P% = &1906
 30   [ OPT I%
 40   LDA #138
 50   LDX #0
 60   LDY #82
 70   JSR &FFF4
 80   LDY #85
 90   JSR &FFF4
100   LDY #78
110   JSR &FFF4
120   LDY #14
130   DEY
140   JSR &FFF4
150   RTS:]
160   NEXT
```

Program 1. Calling by name

CHANGED LOCATIONS from John Swift £5

HAVING endured frustrations of the 0.1 operating system with more than 30 FX and OSBYTE calls being 'only available from issue 1.0', I was pleased to install my new 1.2 OS in the assurance that all would now be well. But no! Acorn in its wisdom has done some rearranging of addresses.

As part of a drawing program I have written, it was necessary to locate the position of the graphics cursor. Jeremy Ruston's *BBC Revealed* gives the four locations where the X and Y co-ordinates of the graphics cursor are stored in memory as:

	LSB	MSB
X	&033C	&033D
Y	&033E	&033F

Unfortunately this is not true with OS 1.2.

After a little experimentation – and further frustration – I devised program 2 which, although written for this specific problem, can be adapted for testing other locations.

Running the program, we discover the location of the graphics cursor is now stored in:

	LSB	MSB
X	&0310	&0311
Y	&0312	&0313

I would be interested to learn of other similar address alterations.

The address locations used by the OS and Basic are of interest, but it is worth repeating Acorn's warning on the perils involved in tinkering with them. Later version of the OS and Basic will not support programs written in this way; and neither will the Tube. However, this said, let's hear from anyone who has discovered locations of interest.

```
 10 MODE 4
 20 X=400:Y=300
 30 MOVE X,Y
 40 FOR N= &0000 TO &03FE
 50 L=?M:H=?(M+1)
 60 V=L+(H*256)
 70 IF V = X THEN PRINT"X AT LOCATION " ~M,~M+1
 80 IF V = Y THEN PRINT"Y AT LOCATION " ~M,~M+1
 90 NEXT M
100 PRINT "END"
110 END
```

Program 2. Testing locations

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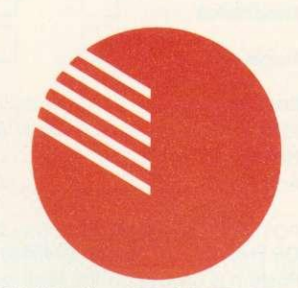
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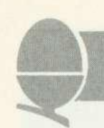
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INTERRUPT-DRIVEN PRINTER SPOOLER by F. Maddix

THIS routine enables you to perform normal keyboard operations, program development, etc, while printing out a text file from disc or cassette (although you will need motor control on the latter). It works by setting up the interval timer to interrupt about 30 times a second. The interrupt routine gets a character from the file (which must be a text file) and sends it to the printer.

You can alter the rate of interrupt (line 680), but I have found that if it is any more frequent than 30 times a second, the occasional character is lost on the printout (this could be due to my slow GP100-A printer hanging the interrupt routine so that it interrupts itself). A slower rate just results in the occasional pause at the end of the line.

There is an automatic page skip every 60 lines: on my printer, which has no hardware form feed, a few line feeds are output to the printer. This can be altered in line 500.

Unfortunately, this program does not work with Wordwise. For some reason, the Wordwise initialisation sequence 'walks over' the disc filing area resulting in a 'channel' message. I would be interested to hear if anyone solves this problem.

The program is fairly straightforward, and uses some memory below Himem. It is capable of almost infinite improvement!

KEYBOARD BLEEP by N. Odell

£5

I HAVE found program 4 invaluable when entering listings in magazines. It causes the BBC to emit a sound each time a key is pressed.

Readers with OS1.0 or higher may control the pitch and length of the sound by *FX213 and *FX214 respectively (*Acorn User*, January 1983 page 6).

The program can be deleted after it has been run and will survive a soft break.

Also, in answer to Mr Doggett's question in the July issue, *FX202,X controls the caps lock/shift lock functions as follows:

X=0	CAPS AND SHIFT LOCK ON
X=16	SHIFT LOCK ON
X=32	CAPS LOCK ON
X=48	CAPS AND SHIFT LOCK OFF

Finally, a note on *FX200,X. This is a form of program protection. If X=1, the escape key is disabled; if X=2 the memory is cleared when break is pressed, and both if X=3.

```
10A%=!&210 AND &FFFF
20P%=&D50
30[OPT 2
40PHA
50LDA#7
60JSR &FFEE
70PLA
80JMP A%
90]
100?&210=&50:?&211=&D
110*KEY10 ?&210=&50:?
   &211=&D |M
```

Program 4. Beeps with each key press

```
  10  REM By F.J. Maddix
  20  REM Acorn User October 1983
  30  REM TO USE: CHAIN "SPOOLER"
  40  REM IT PROMPTS FOR FILENAME
  50  HIMEM=HIMEM-&80
  60  FOR J=0 TO 3 STEP 3
  70     P%=HIMEM
  80     [OPT 0
  90     \Interrupt handler
 100     .GBYTE
 110    PHP:PHA:TYA:PHA:TXA:PHA
 120    .gett
 130    \ Get a byte from file (channel
 in Y)
 140    LDY &70:JSR &FFD7:BCS FIN:CMP
&0A:BEQ CRCHK:PHA
 150    \ Enable printer, send char, di
sable printer
 160    LDA #2:JSR &FFEE:LDA #1:JSR &FF
EE
 170    PLA:JSR &FFEE
 180     LDA #3:JSR &FFEE
 190    \ Reload interval timer
 200    LDX #tim MOD 256:LDY #tim DIV 2
56:LDA  4:JSR &FFF1:JMP EXIT
 210     .FIN
 220    LDY &70:LDA #0:JSR &FFCE
 230     .EXIT
 240    PLA:TAX:PLA:TAY:PLA:PLP:RTS
 250    \ Throw two CRs if at 60th line
 260    .CRCHK
 270    DEC &71:BNE gett
 280    LDA #60:STA &71:LDA #2:JSR &FFE
E
 290    LDA #1:JSR &FFEE
 300    LDA #&0A:JSR &FFEE:LDA #1:JSR &
FFEE
 310    LDA #&0A:JSR &FFEE:LDA #3:JSR &
FFEE
 320     JMP gett
 330    .tim:]
 340   NEXT J
 350 INPUT "FILE",F$
 360 Y%=OPENIN F$
 370 REM Stuff handler address at &220
 380 ?&70=Y%:?&220=GBYTE MOD 256:?&221=
GBYTE DIV 256
 390 REM Load interval timer with
 400 REM five bytes at .tim
 410 X%=tim MOD 256:Y%=tim DIV 256:FOR
I=tim+1 TO tim+4:?I=&FF:NEXT:?tim=&FC:A%
=4:CALL &FFF1
 420 ?&71=60: REM Set lines per page
 430 REM Enable timeout event
 440 *FX14,5
```

Program 3. Printer spooler

QUICKSORT FOR SPEED by Robin Tracy

£10

THE Shell sorting program in June's *Acorn User* (page 16) can be tweaked for higher efficiency. I can lower Stan Froco's 3.04 secs with 316 exchanges to 2.31 secs and 230 exchanges. Lines 180 and 210 could be altered thus:

180 n% = 121
210 n% = n% DIV 3

There is also a minor improvement in speed when the line numbers are multiples of 128.

The number 121 is part of an important series 1, 4, 13, 40, 121, 364 and so on – multiply the previous member by three and add one which is mentioned in Knuth's book to reduce exchanges.

However, the most impressive method is 'Quicksort', and can be written nicely for the BBC micro as a procedure which can call itself and hence illustrate recursion (program 5). For more details, take a look at *Algorithms + Data Structures = Programs* by N. Wirth.

```
1000 DEF PROCquicksort(S%,F%)
1010 LOCAL z$,y$,T%,G%
1020 T%=S% : G%=F%
1030 z$=name$((T%+G%)DIV2)
1040 REPEAT
1050 IF name$(T%)<z$ THEN T%=T%+1 : GOTO1050
1060 IF z$<name$(G%) THEN G%=G%-1 : GOTO1060
1070 IF T%<=G% THEN y$ = name$(T%) : name$(T%) =
     name$(G%) : name$(G%) = y$ : T%=T%+1 : G%=G%-1
1080 UNTIL T%>G%
1090 IF S%<G% THEN PROCquicksort(S%,G%)
1100 IF T%<F% THEN PROCquicksort(T%,F%)
1110 ENDPROC
```

Program 5. Quicksorting

PROGRAM LOADING CLUE from S. Munn

£5

R.J. LEWIS writes: When loading a program that contains machine code the result is often similar to this (after *OPT1,2):

```
FILENAME   22  2300  00000E00  00001000
                ▲        ▲         ▲
               (A)      (B)       (C)
```

A can normally be found using TOP–PAGE but this does not work here. My question is therefore how do I find the values of A, B and C so they can be stored in a variable. I have looked at using OSFILE but this doesn't appear to help. Can I peek the values direct from memory?

By coincidence, Mr S. Munn sent in a piece which answers the question for OS 0.1. Does anyone have the answer for OS 1.2?

WHILE looking around my Beeb's memory, I noticed that locations &2E8 to &2FF seemed to be reserved. I had a closer look after loading my favourite game (Lemmings) and found that locations &2E8 to &2F1 contained the ASCII values of the program name: locations &2F4 to &2F7 the load address; &2F8 to &2FB the execution address; and &2FC to &2FF the program length.

This information may be useful to those wishing to write verify routines etc. This works on my Beeb (OS 0.1 EPROM). Figure 1 shows what I discovered.

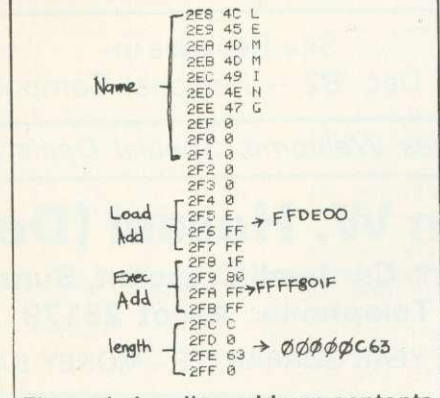


Figure 1. Loading address contents

LOGICAL? by Keith Walker

£5

WITH regard to the use of logical operators in decision statements in Basic programs, I feel it would be worth re-iterating that these do not work as ordinary English language logic. For example, the following lines are quite acceptable as an input validating routine:

```
100 REPEAT
110 PRINT "Type in YES or NO";
140 UNTIL INSTR("YNyn",GET$)
```

However, if you try to reverse this logic by adding from line 120:

```
120 reply$ = GET$
130 IF NOT INSTR("YNyn",reply$)=TRUE THEN PRINT "Try again!"
140 UNTIL INSTR("YNyn",reply$)
```

the result will not be very helpful until you alter line 130 to read:

```
130 IF INSTR("YNyn",reply$)=FALSE THEN PRINT "Try again!"
```

A very good point here. The reason for this is that *all* numbers except zero are treated as true by BBC Basic, although the function TRUE returns –1. If Y is pressed, INSTR returns 1, and not 1 is –2, which is still true.

The replacement line solves this because only zero will result in the message being output, and zero occurs if and only if a key other than Y, N, y or n is pressed.

SPACE TRAP by Tom Boyd

£5

I WASTED 20 minutes on an obscure feature of BBC Basic. Perhaps I can save others some time. I was working on a program rather like:

```
10 READ A$
20 PRINT A$
30 IF A$="FRED" THEN END
40 GOTO 10
50 DATA ONE, TWO, THREE, FRED
```

The program ran as expected, but instead of ending, it stopped on an 'out of data 'error: FRED had not been recognised. The problem was that I had moved the DATA line with the copy key. My finger had lingered on the button, and the BBC interpreted my final datum as 'FRED<space><space><space>', ie the trailing spaces registered.

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VAMPIRE

Michael Murray presents a 32k game for two players using joystick or keyboard. It runs on the BBC micro and Electron

VAMPIRE was written for a 32k BBC micro to run on joysticks or keyboard. It is a competitive game for two players, and makes use of the BBC's special facilities – particularly the re-definition of colours, application of colours using exclusive OR, and procedures. The program is fairly well documented in the listing, and full playing instructions in mode 7 form the first part of the program.

The game will run on the Electron, although the instructions are automatically switched to mode 6. These can be left out, and the game just run from line 240. To speed the game up on the Electron, take out all the non-significant spaces (see *Acorn User*, September p47), the REM statements, any unnecessary code (eg joystick calls), and use multi-statement lines. However, it will never be as fast as on the BBC machine unless it's translated into machine code. Rewriting the game to run in one of the lower-resolution modes would speed it up quite considerably.

The program was written to use the joysticks held so the fire buttons are pressed with the forefingers. If you wish to use them so the buttons are thumb operated, it will be necessary to alter the +/– signs in lines 1350,1360,1560, and 1570, otherwise the controls will be reversed.

If you don't want the tunes to play, remove lines 2360–2410. The data given in these can be altered to produce new tunes. You might also like to write an extra piece of code which asks whether the player wants sound.

The program runs as follows:

Lines 30–60 are titles which do not

```
   10 REM ** GAME INSTRUCTIONS TO LINE 230 **
   20 MODE7:VDU23;8202;0;0;0
   30 PRINT'TAB(11,8);CHR$129;CHR$141;"VAMPIRE"
:PRINTTAB(11,9);CHR$129;CHR$141;"VAMPIRE"
   40 PRINTTAB(8,14);CHR$131;"by Michael Murray
":PRINTTAB(9,19);CHR$130;"Acorn User 1983":PRIN
TTAB(10,22);CHR$130;"32k BBC micro"
   50 PROCTUNE
   60 TIME=0:REPEAT UNTIL TIME>300
   70 VDU12
   80 S$=CHR$132+CHR$157+CHR$135
   90 VDU132,157,10,13
  100 PRINTS$;"The object of the game is for th
e"'S$;"priest to bless all bl<ack graves"'S$;"a
nd turn them all white, and for"'S$;"the vampir
e to curse the white ones"'S$;"and turn them al
l black."'S$'S$;"The priest may only bless by d
ay."
  110 PRINTS$;"The vampire may curse only at ni
ght."'S$'S$;"To bless or curse, position your"'
S$;"charactér over a grave and press"'S$;"FIRE
if using the Joysticks."'S$'S$;"The game is won
 when all the crosses"'S$;"are the same colour.
"
  120 PRINTS$;"The game may be ended earlier if
"'S$;"the priest can catch and bless the"'S$;"v
ampire during the day, or if the"'S$;"vampire c
an catch and curse the"'S$;"priest during the n
ight."'S$
  130 VDU132,157,131:PRINT"PRESS THE SPACE BAR
TO CONTINUE"
  140 *FX21,0
  150 IF GET$<>" " THEN 150
  160 CLS
  170 PRINTS$'S$;"The priest is always safe in
his"'S$;"church and the vampire is always"'S$;"
safe in his castle."'S$'S$;"A dark blue sky sho
ws night and a"'S$;"light blüe one shows day. "
'S$;"The change over will be sudden and"
  180 PRINTS$;"at random intervals."'S$'S$;"You
 can use either Joysticks or"'S$;"the keyboard.
 The left hand stick"'S$;"controls the priest.
The right hand"'S$;"stick controls the vampire.
"'S$'S$;"        Priest    KEYS   Vampire"
  190 PRINTS$;"                           ===="'S$;"
 W                    @"'S$;"         ^
    ^"'S$;"     A [ ] D              + [ ] (SQ BR)
"'S$;"         v                    v"'S$;"    (SHIF
T)            (SPACE)"'S$
  200 PRINTS$;"Press E for easy qame, H for har
d."
  210 *FX21,0
  220 A%=GET
  230 IF A%=69 THEN A%=1 ELSE IF A%=72 THEN A%=
2 ELSE 220:REM *** END OF INSTRUCTIONS ***
  240 REM ***** SETUP GAME *****
  250 MODE2
  260 VDU5
  270 REM ******** DEFINE PRIEST ********
  280 VDU23,224,60,60,255,60,60,24,255,255
  290 VDU23,225,255,189,189,189,189,126,126,126
  300 VDU23,226,126,126,126,126,228,4,4,7
  310 VDU23,227,126,126,126,126,39,32,32,224
  320 REM ******** DEFINE BAT ********
  330 VDU23,228,112,249,61,63,15,15,3,3
  340 VDU23,229,14,143,188,252,240,240,192,192
  350 VDU23,230,1,1,7,31,63,57,48,32
  360 VDU23,231,128,128,224,248,252,156,12,4
  370 REM ******** DEFINE CROSS *******
  380 VDU23,232,24,24,126,126,24,24,24,24
  390 REM ******** DEFINE WINDOW ********
  400 VDU23,233,24,24,60,60,126,126,255,255
  410 VDU23,234,255,255,255,255,255,255,255,255
  420 DIM CX%(30)
  430 DIM CY%(30)
  440 REM ******** SET VARIABLES ********
  450 XP%=250:YP%=800 :REM PRIEST CO-ORD
  460 XV%=1000:YV%=800 :REM VAMPIRE CO-ORD
  470 XPA%=0: YPA%=0: XVA%=0: YVA%=0: J%=1
  480 WC%=15 :REM WHITE CROSS COUNT
  490 PRIEST=TRUE
  500 VAMPIRE=TRUE
  510 REM ******** SET SCENE ********
  520 GCOL0,0
  530 MOVE1279,0:MOVE1279,700:PLOT85,0,0
  540 MOVE0,700:PLOT85,1279,700
  550 GCOL0,15
  560 MOVE1279,1023:PLOT85,0,700
  570 MOVE0,1023:PLOT85,1279,1023
  580 REM ******** CHURCH ********
  590 GCOL0,3
  600 MOVE48,700:MOVE152,700:PLOT85,152,900
  610 MOVE48,700:PLOT85,48,900
  620 MOVE152,900:PLOT85,100,1000
  630 MOVE152,848:MOVE352,848:PLOT85,352,700
  640 MOVE152,852:PLOT85,148,700
  650 GCOL0,15
  660 MOVE72,900:VDU233,8,10,234
  670 REM ******** CASTLE ********
  680 GCOL0,7
  690 MOVE 940,700:MOVE1200,700:PLOT85,1200,900
  700 MOVE940,900:PLOT85,940,700
  710 PROCTOWER(940,840)
  720 PROCTOWER(1200,840)
  730 GCOL0,15
```

listing continued ▶



affect the running of the game. They may be omitted.

Lines 70–230 are the playing instructions. They do not affect the running of the game and may be taken out if the instructions are read from the listing.

Lines 270–310 define the characters to be used to print the priest. There are two alternative characters for the legs to create movement.

Lines 320–360 define the characters to be used to print the vampire. There are alternative sets of characters to create movement.

Lines 370–410 define the characters to be used as crosses and windows. The window shape is also used as gravestones – these are used as an alternative to the crosses in the easy game.

Lines 420–430 reserve storage for the co-ordinates of the crosses (or grave stones).

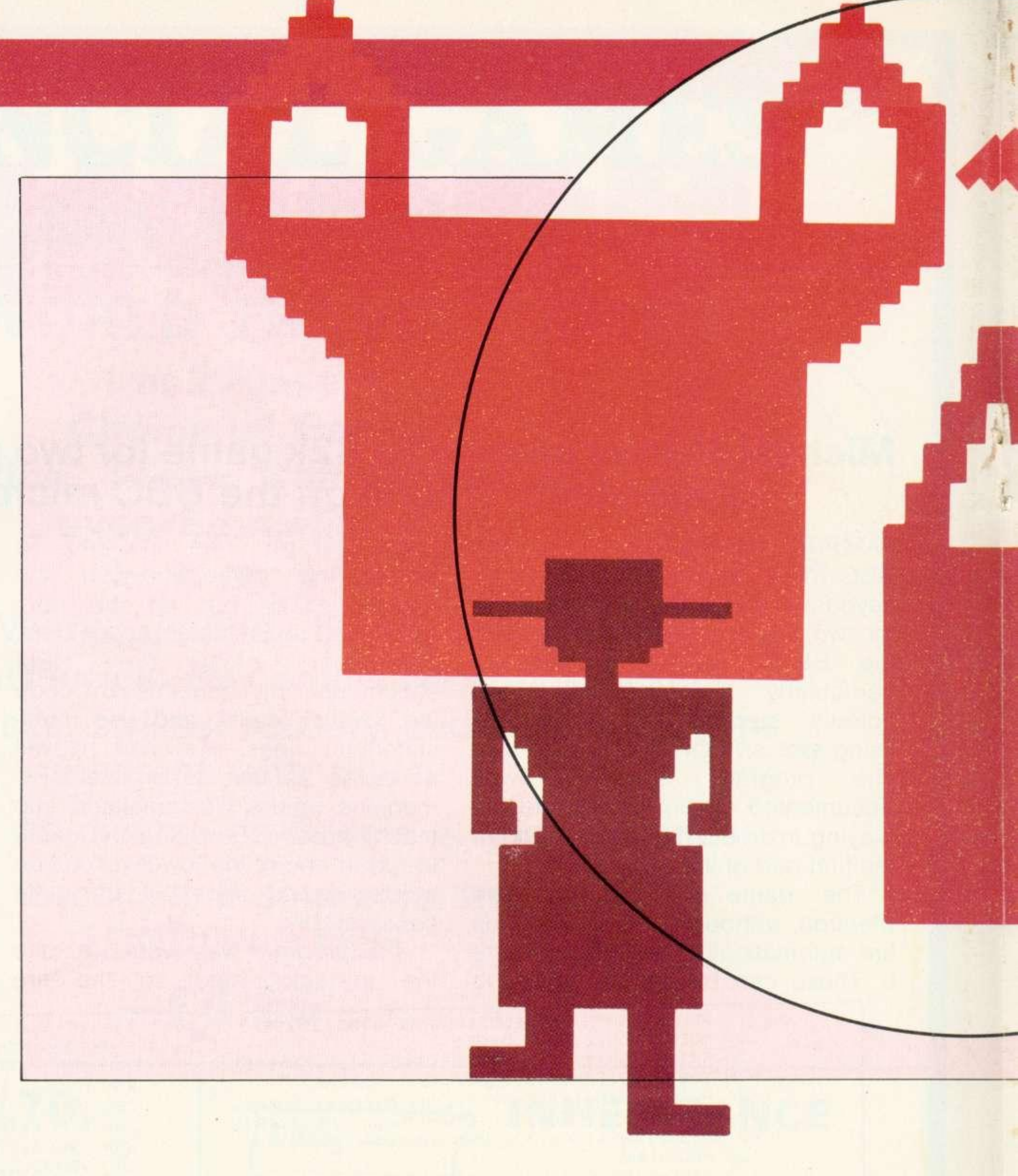
Lines 440–500 set the start positions of the characters.

Lines 510–570 draw the background.

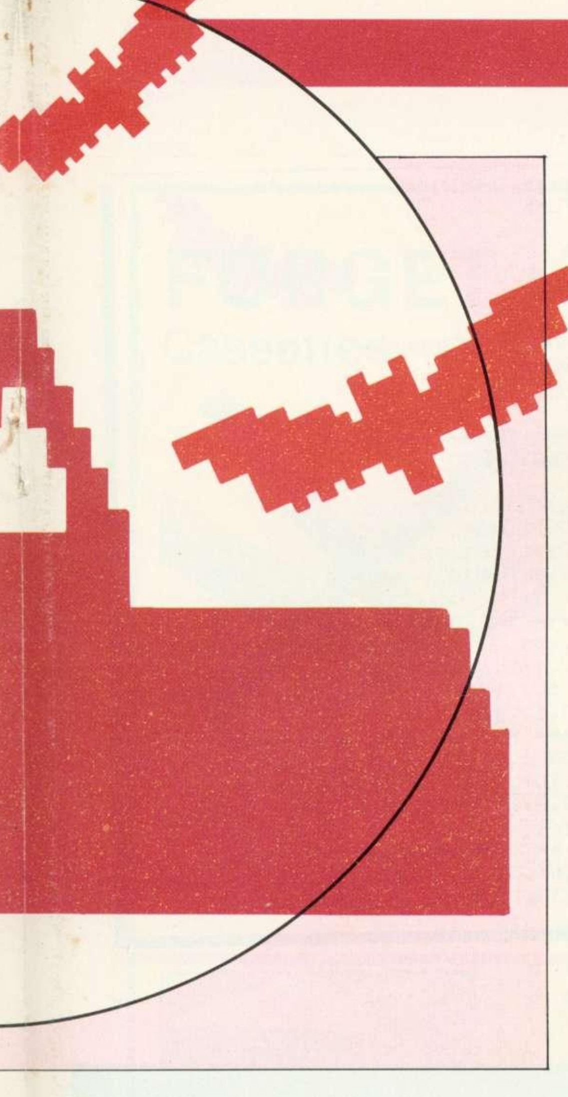
Lines 580–660 draw the church.

Lines 670–750 draw the castle.

Lines76–880 place the crosses or gravestones in the right place, half in black and half in white.



```
740 MOVE 908,960:VDU233,8,10,234
750 MOVE 1172,960:VDU233,8,10,234
760 REM ******** CROSSES ********
770 GCOL0,2
780 FOR X=100 TO 500 STEP 100
790   FOR Y=100TO 500 STEP 200
800     MOVEX,Y
810     IF A%=2 VDU232 ELSE PROCGRAVE
820     NEXT:NEXT
830 GCOL0,1
840 FOR X=700 TO 1100 STEP 100
850   FOR Y=100 TO 500 STEP 200
860     MOVEX,Y
870     IF A%=2 VDU232 ELSE PROCGRAVE
880     NEXT:NEXT
890 REM ******** GAME START ********
900 GCOL3,8
910 MOVE XP%,YP%
920 VDU224,8,10,225,8,10,226:REM DRAW PRIEST
930 GCOL3,12
940 MOVE XV%,YV%
950 VDU228,229:REM DRAW VAMPIRE
960 GAME=TRUE:START=TRUE
970 REPEAT
980   IF (START=TRUE AND RND(2)>1) GOTO 1090
990   TIME=0:TD=500+RND(1000)
1000  REM ******** DAY ********
1010  VDU19,0,3,0,0,0,19,1,0,0,0,0,19,2,7,0,0
,0,19,3,7,0,0,0,19,4,7,0,0,0,19,5,0,0,0,19,6,7,
0,0,0,19,7,4,0,0,0,19,8,5,0,0,0,19,9,0,0,0,0,19
,10,7,0,0,0,19,11,5,0,0,0,19,12,1,0,0,0,19,13,0
,0,0,0,19,14,7,0,0,0,19,15,6,0,0,0
1020  REPEAT
1030    PROCPRIEST
1040    PROCVAMPIRE
1050    IF (ADVAL(0) AND 2) OR J%=0 THEN PROC
BLESS
1060    PROCPRIEST2
1070    PROCVAMPIRE2
1080    UNTIL TIME>TD
1090  TIME=0:TN=500+RND(1000)
1100  REM ******** NIGHT ********
1110  VDU19,0,2,0,0,0,19,1,0,0,0,0,19,2,7,0,0
,0,19,3,5,0,0,0,19,7,0,0,0,0,19,8,1,0,0,0,19,9,
0,0,0,0,19,10,7,0,0,0,19,11,1,0,0,0,19,12,1,0,0
,0,19,13,0,0,0,0,19,14,7,0,0,0,19,15,4,0,0,0
1120  REPEAT
1130    PROCPRIEST
1140    PROCVAMPIRE
1150    IF (ADVAL(0) AND 1) OR J%=0 THEN PROC
CURSE
1160    PROCPRIEST2
1170    PROCVAMPIRE2
1180    UNTIL TIME>TN
1190  START=FALSE
1200  UNTIL GAME=FALSE
1210 MOVE0,800
1220 GCOL0,0
1230 PRINT"  Press SPACE BAR"'"  to play again
"
1240 GCOL0,1
1250 CLEAR
1260 IF INKEY(-99) GOTO 1265 ELSE GOTO 1260
1265 MODE7:PRINT''''CHR$129;"Press E for easy
game, H for hard":GOTO 210
1270 STOP
1280 REM ******** MOVE PRIEST *******
1290 DEF PROCPRIEST
1300 GCOL3,8
1310 MOVE XP%,YP%
```



Lines 890–960 print the priest and vampire in their start positions and set the game indicators.

Lines 970–1200 form the main game loop which is executed until the game is won.

Line 980 determines if the game starts with day or night.

Line 990 determines the length of the day.

Line 1010 defines all the colours to be used for the daytime.

Lines 1020–1080 contain a loop of the day-time activities.

Lines 1090–1180 are the night-time equivalents of lines 990–1080.

Line 1190 ensures random selection of day or night only occurs on the first run through the main game loop.

Lines 1230–1270 allow another game to begin without leaving the program.

Lines1280–1500 create the procedure to control the priest.

Lines 1320–1340 erase him in his present position.

Lines 1350–1360 calculate his new position.

Lines 1370–1410 keep him within his permitted playing area.

Lines 1420–1430 print him in his new position.

Lines 1450–1500 from an auxiliary procedure to increase the leg movement.

Lines 1510–1720 are equivalent to 1280–1500 but deal with the vampire.

Lines 1730–1930 define the procedure which is called if the priest's fire button is pressed during the day-time.

Line 1750 detects if the priest has blessed the vampire, which is a winning move.

Line 1760 detects if the priest has blessed a black grave.

Line 1770–1790 calculate the co-ordinates of the grave and change it to white.

Lines 1830–1920 are used if the priest has won. They remove the vampire, print a winning message, play a victory tune, and set the end of game indicator.

Lines 1940–2160 are called if the vampire's fire button is pressed at night time. They are similar to lines 1730–1930 in operation.

Lines 1270–2230 play the tunes. All references to this procedure is optional.

Lines 2240–2270 draw the gravestone/window shape.

Lines 2280–2350 draw the towers on the vampire's castle.

Lines 2360–2410 contain the notes for the tunes used in program. These may be omitted if the tunes are not to be played.

```
1320 VDU224,8,10,225,8,10,226
1330 IF INKEY(-66) THEN J%=0: XPA%=XPA%-20 ELS
E IF INKEY(-51) THEN J%=0: XPA%=XPA%+20 ELSE  X
PA%=0
1340 XP%=XP%+(64-(ADVAL(3)DIV500))*J%+XPA%
1350 IF INKEY(-34) THEN J%=0: YPA%=YPA%+20 ELS
E IF INKEY(-1) THEN J%=0: YPA%=YPA%-20 ELSE  YP
A%=0
1360 YP%=YP%-(64-(ADVAL(4)DIV500))*J%+YPA%
1370 IF (XP%>268 OR XP%<68) AND YP%>700 YP%=70
0
1380 IF XP%<40 XP%=40
1390 IF XP%>1180 XP%=1180
1400 IF YP%<100 YP%=100
1410 IF YP%>800 YP%=800
1420 MOVE XP%,YP%
1430 VDU224,8,10,225,8,10,227
1440 ENDPROC
1450 DEF PROCPRIEST2
1460 GCOL3,8
1470 MOVE XP%,YP%
1480 VDU224,8,10,225,8,10,227,8,11,11
1490 VDU224,8,10,225,8,10,226
1500 ENDPROC
1510 REM ******** MOVE VAMPIRE ********
1520 DEF PROCVAMPIRE
1530 GCOL3,12
1540 MOVE XV%,YV%
1550 VDU228,229
1560 IF INKEY(-88) THEN J%=0: XVA%=XVA%-20 ELS
E IF INKEY(-89) THEN J%=0: XVA%=XVA%+20 ELSE  X
VA%=0
1570 XV%=XV%+(64-(ADVAL(1)DIV500))*J%+XVA%
1580 IF INKEY(-72) THEN J%=0: YVA%=YVA%+20 ELS
1590 YV%=YV%-(64-(ADVAL(2)DIV500))*J%+YVA%
1600 IF (XV%<901 OR XV%>1111) AND YV%>650 YV%=
650
1610 IF XV%<0 XV%=0
1620 IF XV%>1150 XV%=1150
1630 IF YV%<70 YV%=70
1640 IF YV%>800 YV%=800
1650 MOVE XV%,YV%
1660 VDU230,231
1670 ENDPROC
1680 DEF PROCVAMPIRE2
1690 GCOL3,12
1700 MOVE XV%,YV%
1710 VDU230,231,8,8,228,229
1720 ENDPROC
1730 REM ******** PROCBLESS ********
1740 DEF PROCBLESS
1750 IF POINT(XP%+32,YP%-48)=4 GOTO 1830
1760 IF POINT(XP%+32,YP%-48)=9 ORPOINT(XP%+32,
YP%-48)=5 GOTO 1770 ELSE GOTO 1930
1770 MOVE((XP%+32)DIV100)*100,(YP%DIV100)*100
1780 GCOL0,2:VDU7
1790 IF A%=2 VDU232 ELSE PROCGRAVE
1800 WC%=WC%+1
1810 IF WC%=30 GOTO 1860
1820 GOTO1930
1830 GCOL3,12
1840 MOVEXV%,YV%
1850 VDU230,231
1860 MOVE64,600
1870 GCOL0,2
1880 PRINT"THE GOOD TRIUMPH !"
1890 RESTORE2380
1900 ENVELOPE1,2,0,0,0,0,0,0,100,1,-1,-1,100,1
```

listing continued ▶



```
26
 1910 PROCTUNE
 1920 GBME=FALSE:GOTO 1200
 1930 ENDPROC
 1940 REM ******** PROCCURSE ********
 1950 DEF PROCCURSE
 1960 IF POINT(XV%+64,YV%-16)=4 GOTO 2040
 1970 IF POINT(XV%+64,YV%-16)=14 OR POINT(XV%+6
4,YV%-16)=6 GOTO 1980 ELSE GOTO 2160
 1980 MOVE((XV%+64)DIV100)*100,((YV%+32)DIV100)
*100
 1990 GCOLO,1:VDU7
 2000 IF A%=2 VDU232 ELSE PROCGRAVE
 2010 WC%=WC%-1
 2020 IF WC%=0 GOTO 2070
 2030 GOTO2160
 2040 GCOL3,8
 2050 MOVE XP%,YP%
 2060 VDU224,8,10,225,8,10,227
 2070 MOVE64,600
 2080 GCOLO,1
 2090 PRINT"  HELL REIGNS !"
 2100 ENVELOPE2,0,-1,0,1,1,1,1,100,1,-1,-1,100,
126
 2110 SOUNDO,2,6,200
 2120 RESTORE2400
 2130 ENVELOPE1,2,0,0,0,0,0,0,4,-1,-2,-1,126,80
 2140 PROCTUNE
 2150 GAME=FALSE:GOTO 1200
 2160 ENDPROC
 2170 REM ******** PROCTUNE ********
 2180 DEF PROCTUNE
 2190 REPEAT
 2200   READP,D
 2210   SOUND1,1,P,D
 2220   UNTIL D=0
 2230 ENDPROC
 2240 REM ******** PROCGRAVE ********
 2250 DEF PROCGRAVE
 2260 VDU234,8,11,233
 2270 ENDPROC
 2280 REM ******** TOWER ********
 2290 DEF PROCTOWER(X,Y)
 2300 MOVEX,Y
 2310 PLOT1,-48,48:PLOT81,96,0
 2320 PLOT1,0,72:PLOT81,-96,-72
 2330 PLOT1,0,72:PLOT81,96,0
 2340 PLOT1,-48,48:PLOT81,-48,-48
 2350 ENDPROC
 2360 REM ******** INTRO TUNE DATA ***
 2370 DATA157,6,149,2,145,6,157,2,177,6,185,2,1
77,4,177,6,173,2,165,6,173,2,177,6,165,2,157,4,
193,6,185,2,177,6,173,2,177,6,165,2,173,6,157,2
,173,6,185,2,177,12,177,0
 2380 REM ******** PRIEST TUNE DATA *****
 2390 DATA81,8,33,1,81,16,61,8,81,8,89,16,61,16
,97,8,89,8,97,8,101,8,97,16,89,8,81,8,33,1,81,1
6,77,8,69,8,77,8,81,8,89,8,77,16,69,12,61,4,13,
1,61,24,61,0
 2400 REM ******** VAMPIRE TUNE DATA ***
 2410 DATA33,16,61,32,53,16,5,1,53,16,49,32,33,
16,1,1,33,16,81,32,73,16,81,32,69,40,69,0
```

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THE KEY TO TAB

by George Hill

HAVE you ever wished the TAB key actually served its proper purpose? The assembly language program (program 1) causes the TAB key to insert spaces into the keyboard buffer, so the cursor jumps to a predefined position.

In Basic on the Beeb, the PRINT statement, when used with the comma as a separator, sets the screen out into columns set to follow the last byte of @% (*User Guide* p70). The TAB key has been made to follow the same variable. So on pressing TAB the cursor should advance to the start of the next column. The columns will be 10 characters wide when the machine is swtiched on (@% defaults to &A0A). If you change @% you can vary the column width. For example, @%=&A06 will set the column width to 6, (but still maintain 10 figures for decimal numbers).

This is a boon for writing legible programs, particularly in assembly language, where the label, code, and comment fields can be suitably tabbed.

The program works by intercepting the OSRDCH routine via the ReaD CHaracter Vector. The routine checks for character &09 (the TAB key generates it), and does nothing in its absence. If 09 is present the value of POS (the horizontal cursor position) is calculated via OSBYTE, and the low byte of @% subtracted until the result is negative. Spaces are now inserted until the result becomes 0 again, effectively moving the cursor along to the next preset TAB position. Values of @% over 31 have peculiar effects, as do 0 or negative values, so these have been forbidden!

```
 10 REM ***TAB***
 20 REM G.B.HILL APRIL 1983
 30 REM to set the TAB key to tab to the preset
    value in @%, if less than 32
 40 osbyte=&FFF4
 50 osrdch=&FFE0
 60 S%=PAGE-&100
 70 old_rdchv=S%
 80 store=S%+2
 90 tab_value=S%+3
100 ?old_rdchv=?&210
110 ?(old_rdchv+1)=?&211
120 S%=S%+4
130 FOR pass=0 TO 2 STEP 2
140 P%=S%
150 [OPT pass
160 \MAIN PROGRAM
170 .new_rdchv     jsr old_osrdch
180                pha
190                eor #9              \test for TAB key
200                beq tab             \branch if detected
210                pla                 \restore accumulator
220                rts                 \and return
230 \
240 \SUBROUTINES TO READ A CHARACTER, AND TO INSERT SPACES
250 \
260 .old_osrdch    jmp (old_rdchv)
270 \
280 .tab          txa:pha:tya:pha      \save registers
290               lda &400             \@% [low byte]
300               sta tab_value        \store @%
310               bne ok               \if non-zero
320               inc tab_value        \increase to 1 if zero
330 .ok           lda tab_value
340               cmp #32
350               bcc spaces           \if <32
360               lda #10
370               sta tab_value        \reset to 10 if too big
380 .spaces       lda #&86
390               jsr osbyte           \read POS & VPOS
400               txa                \transfer POS to accumulator
410 .subtract_loop sec
420                sbc tab_value
430                bpl subtract_loop
440                sta store      \store negative result
450 .tab_loop lda #&8A
460           ldx £0
470           ldy #32                  \insert spaces
480           jsr osbyte               \into kbd buffer
490           inc store                \until store reaches zero
500           bne tab_loop
510           pla:tay:pla:tax:pla \restore registers
520           lda#0                    \do nothing on returning
530           rts                      \and return
540 ]
550 NEXT pass
560 ?&210=new_rdchv MOD 256
570 ?&211=new_rdchv DIV 256
580 PRINT"TAB KEY NOW SET TO FOLLOW @%"
590 END
```

Program 1. The real TAB



OSFILE TO LOOK UP AND MERGE PROGRAMS

THE operating system routine entered at &FFDD called OSFILE will allow you to look up file entries, and load or merge files (which can of course be programs).

The program OSFILE (program 1) illustrates how it works. It is disc-oriented, as the problems which arise with file handling are not so critical to tape users. Modifications could be made to make it operate similarly for tape.

There are five parts to the program. First, space is set up near the top of memory for the blocks required by OSFILE. Next, PROCcheck_name checks the filename supplied follows the necessary restrictions for disc systems. PROCcheck_file checks the file exists. This can be used in a variety of other circumstances: to avoid the fatal 'File not found' message, and to avoid over-writing existing files. Then PROCload_file loads a file into memory at the addresses specified in its control block. Spurious error messages can appear, hence line 450. (Perhaps some clever reader will delete the line and explain why incorrect syntax errors are issued!) This may not seem too useful a function, but illustrates that a new file can be loaded in from another program, despite the fact that LOAD is forbidden in BBC Basic programs. (Although *LOAD can be used.)

Finally, the most useful bit, PROCmerge_file allows the merging of files from within a Basic program, and with careful handling of TOP and LOMEM (lines 550, 560 and 180) the merged-on program can be GOTOed, deleted, and a new program merged on and run. This enables you to run several programs from a master program without running out of memory. Note that if mode changes occur, you may well over-write the dimensioned blocks, and may have to re-locate them.

```
10 REM Use of OSFILE to merge programs
20 REM G.B.Hill (c) 1983
30 REM Get blocks out of the way
40 MODE7
50 LOMEM=&7B00
60 PRINTTAB(5,5)"File lookup, loading and";TAB(8,6)
   "merging program."''
70 REM Define OS address and reserve space
80 osfile=&FFDD
90 DIM N% 9
100 DIM control_block 17
110 DIM user 3
120 PROCcheck_name
130 PROCcheck_file
140 IF ?user <>1 THEN PRINT"File missing":END
150 INPUT"LOAD (L) or MERGE (M) ",choice$
160 IF choice$="L" THEN PROCload_file :END
170 IF choice$="M" THEN PROCmerge_file ELSE VDU7:
    GOTO 150
180 LOMEM=TOP
190 END
200 DEFPROCcheck_name
210 INPUT"What is the name of the file ",filename$
220 REM add default directory
230 IF MID$(filename$,2,1)<>"." THEN filename$="$.
    "+filename$
240 IF LEN(filename$)>9 THEN PRINT"Only seven
    characters allowed":VDU7:GOTO 210
250 REM add a carriage return
260 $N%=filename$+CHR$&0D
270 REM not strictly necessary to convert to
    capials, but fun!
280 PROCcapitals
290 REM put address of filename in control_block
300 ?control_block=N% MOD &100
310 ?(control_block+1)=N% DIV &100
320 ENDPROC
330 DEFPROCcheck_file
340 REM For file "lookup" accumulator =5
350 REM put address of control_block in X and Y
    registers
360 A%=5:X%=control_block MOD &100:Y% =control_block
    DIV &100
370 !user=USR osfile
380 REM check_file returns 0 in the low byte of user
    if the file is found, non-zero if file is missing
390 ENDPROC
400 DEFPROCload_file
410 REM load A,X and Y registers for file loading
420 A%=&FF:X%=control_block MOD &100: Y%=control_
    block DIV &100
430 REM control_block+6 is non-zero to load at
    address on file
440 ?(control_block+6)=&FF
450 ON ERROR END
460 CALLosfile
470 ENDPROC
480 DEFPROCmerge_file
490 A%=&FF:X%=control_block MOD &100:Y%=control_
    block DIV &100
500 REM prepare control_block for OSFILE call to
    LOAD at TOP-2
510 !(control_block+2)=&FFFF0000+TOP-2
520 ?(control_block+6)=0
530 CALLosfile
540 REM reset TOP
550 ?&12=(TOP+control_block!&0A-2) MOD &100
560 ?&13=(TOP+control_block!&0A-2) DIV &100
570 ENDPROC
580 DEFPROCcapitals
590 REM convert to capitals
600 FOR I=0 TO 8
610 IF N%?I>&40 THEN N%?I=N%?I AND &5F
620 NEXT
630 ENDPROC
```

Program 1. To merge files

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WHERE DO WE GO FROM HERE?

Barry Pickles sets out a plan of action for Atom owners

WHATEVER Acorn may say, the Atom has been effectively abandoned. Whether it goes the way of the ZX80 and MK14 depends largely on the people who use it. Let's begin by looking at what we have.

The Atom is based around the 6502 processor, running nominally at 1 MHz. Its operating environment is provided by a very fast 4k Basic and a 4k operating system. It has nine graphics modes, the highest providing a resolution of 256 x 192 using 6k of RAM – when not needed for graphics, this may be used for programs. Standard outputs are provided for cassette, TV, monitor (RGB or monochrome) and Econet. In addition, two ports carry the bus lines and a single Eurocard may be attached internally. All major components are socketed, allowing easy replacement in the event of a fault.

Sockets are present for 12k of RAM, a floating-point ROM and an extension ROM. By adding the 6522 VIA, a Centronics-type printer can be used and 16 input/output lines are made available – a further four lines are present at the cassette port, as is an audio output.

Atom Basic is very fast. Despite being three years old – a long time in terms of computer design – it is still faster than that in any other computer under £200 and is fast enough to permit real-time games programming. However, the Atom really comes into its own when used in conjunction with its in-built assembler, which may be freely mixed with Basic, providing the best of both worlds – a feature only found on the Acorn range.

When it comes to expansion, printers, and the (very expensive) 96k disc drive, can be easily added. Atom is capable of directly addressing 38k of RAM and cards are available for 16, 32, 64, 128 and 256k additions – the latter being 'sectored', in the manner of a fast disc. A BBC Basic language card and a colour card are produced by Acorn. A plethora of toolbox ROMs have been produced and Acorn themselves do both a word-processing and a spreadsheet ROM.

As Atom normally only supports a 32-column text screen, and doesn't allow mixed text and hi-res graphics, another ROM has been produced (it should be ready by the time that you read this from Procyon), which supports a 42-column screen in mode 4, with text windowing and user-definable characters. Acornsoft's (cassette-based) Datebase package also adapts easily to being blown into a 4k EPROM. To save you having to open the case, a four-way ROM adapter can be bought.

Software abounds. Virtually all the arcade favourites have been done and both Acornsoft and Elinca have business packs. The current situation is that Acornsoft and Acorn will continue to supply Atom software/firmware for the forseeable future – although nothing new will be produced – and to supply technical back-up. Atoms are no longer being made or promoted and existing stocks are being heavily discounted by dealers, with prices as low as £50 being quoted. However, do not expect much dealer support at these prices. Anyone who buys an expanded Atom for less than £150 has got a bargain, even by today's standards.

On the software side, none of the major houses will now accept Atom material, with the exception of A & F, who are pledged to support the Atom until the middle of next year at least – their fortune was founded on Atom material and they feel they owe a debt to their Atom customers. Program Power's range is still available by mail order but Bug-Byte are now entirely retail, so their packs will be largely unavailable. What you will now see is a return to the early 'cottage industry' days of Atom software. The rest is up to you. So how do you stop the Atom from becoming extinct?

First, support those suppliers, big or small, who support your

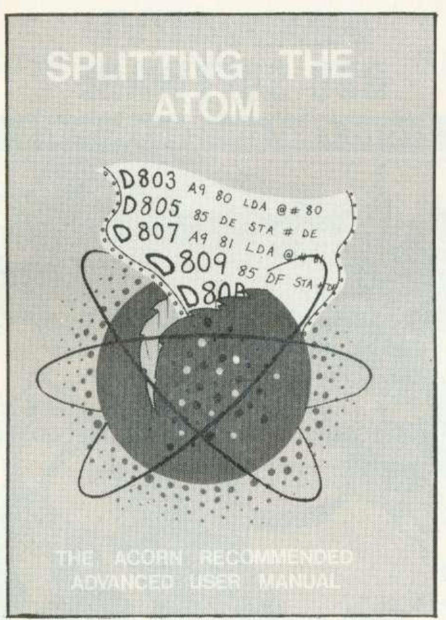
P71▶



machine. Support your user groups – there are various local groups and a national one (see our user group listings). Support the magazines that support you – *Acorn User* will continue to run Atom features for as long as there is a viable readership – and, if you discover a new routine, or a clever way of using an existing routine, let us know, so everyone can share it. Got a new application or an exciting new game? Send it in. If you're marketing your own ideas, send us a sample and we'll try and review it – we get very little sent in these days from commercial sources. Above all, show off your Atom! You have a versatile and controllable machine, useful in many applications. It's a classic design and one that has a useful life for many years to come. Below is a list of those suppliers who actively support the Atom. This list is not in any way intended to be a recommendation, just a source list – anyone we've missed out, let us know who you are and what you're doing.

Acorn/Acornsoft (software, firmware, technical support)
A & F Software (software, toolbox ROM)
Program Power (software, toolbox ROM, ROM adapter, colour board)
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Ross Software (shape table ROM)
Watford Electronics (toolbox ROM)
Willow Software (toolbox ROM)
Ecce Productions (software, book, Atom tape reader for BBC)

ALL YOU NEED TO KNOW



Every ROM routine listed and detailed in Procyon book

THE 8k of ROM used by Atom's interpreter and operating system represents a lot of machine-code and contains many useful routines, all of which are accessible by the user, enabling every efficient and compact programs to be written, taking full advantage of the Atom's capabilities. However, little has been written to tell you where they are and what they do. This, then, is the purpose of *Splitting the Atom*, to delve into the heart of the machine and uncover its secrets.

Before continuing, I must declare an interest. Some time ago, the book's authors, Stevenson and Rockett sent me an early draft to comment upon. I made a few suggestions, which have been incorporated in the final product, and the authors have been kind enought to include me in the list of credits (blush, blush!).

Splitting the Atom is described as 'a manual for informed users' and that's who it is aimed at – those who have tired of just typing in magazine listings and want to get down to some serious programming. It won't teach you programming (except indirectly); it will teach you how to use the Atom efficiently.

It comes as 80 pages of A4, spirally bound. There are nine chapters and four appendices. After a brief introduction, it begins with an explanation of the various stacks used by the system, followed by an overview of the interpreter's structure. Next come details of RAM used by the operating system, and tables for the variable, array and label stacks – you really need these, since the way the Atom stores variables is complex, if not downright evil! Now comes the real meat! A description of *every* ROM routine, with entry points, register and stack usage and suggestions for use. This is followed by a listing of both ROMs, in assembler format. The next chapter gives 11 working examples, with commented listings, including a true cyclic redundancy check routine.

The final chapters cover a description of tape format, CRC and printer use, an outline of the memory-mapped screens (with design charts for each mode) and concludes with an exhaustive set of copy prevention routines. The four appendices provide a memory dump/edit program, a chart of 6502 op-codes, mnemonics and addressing modes, a chart of ASCII and control codes and a description of Procyon's Disatom ROM. The book ends with a comprehensive index to ROM routines. The manuscript was submitted to Acorn and carries the company's recommendation. It is a fitting tribute to the genius of Roger Wilson, who wrote the Atom interpreter for Acorn.

To conclude, armed with this book and *Atomic Theory and Practice* you will know just about everything there is to know about the Atom – the rest is up to you! If you are remotely serious about programming the Atom, this book is a must!

Barry Pickles

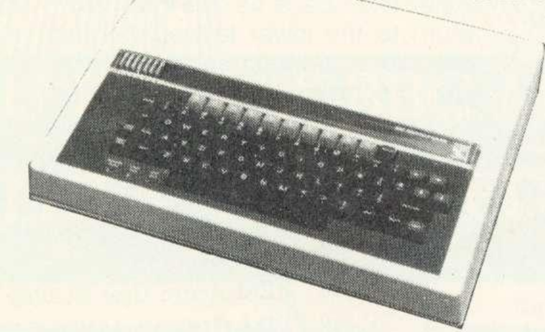
Splitting the Atom, Focusplan, 80pp, £7.24, 57 Westgate, Cleckheaton W. Yorks BD19 5HH. Tel: (0274) 588192.

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FAST ACTION FROM BEEB CONVERT

Planes £6.90 (all prices VAT inclusive), A & F Software, 830 Hyde Road, Gorton, Manchester M18 7JD.

PLANES was originally written for the BBC micro, but this conversion for the Atom is very good. It's a *Galaxians*-type game, with three screens. The first attack wave consists of bombers, relatively slow and not too hard to destroy. Then come the biplane fighters, faster and more deadly, whilst the third screen pits you against helicopters, which really take some beating! After three screens, the whole sequence is repeated.

Graphics are finely detailed with lots of sounds. Three keys are used and joystick conversion would be simple, with a disassembler. Instructions are provided at the start and, during play, the score, high score and lives left (there are three) are displayed. At the end of the game, a score ladder is provided.

It might have been my imagination, but the action seemed faster than the BBC version. This is a lovely game and highly recommended.

ATOM TAPE VERIFY ROUTINE

SINCE it's always a worry saving a long program, listing 1 provides a verify routine. Enter this in the upper text space (ie ?18#82). Now return to the lower text space and save your program in the normal way, but making sure to note the start and end addresses. Type ?18=#82 to re-enter the VERIFY routine, rewind the tape and RUN. If you get a 'failed at' message, check out the recorder, before trying again. Finally, save the verify routine, for future use, by:

*SAVE "VERIFY" 8200 8400

remembering that you must *LOAD this, whenever needed.

```
10 REM Atom verify routine
20 REM Acorn User October 1983
30 DIM F(16); V=#8400; P.$12
40 IN."START ADDRESS" S
50 IN."END ADDRESS" E; L=E-S
60 IF L<2; P.$7;RUN
70 IN."FILENAME" $F
80 P."REWIND TAPE & PRESS return WHEN READY"
90 LI.#FFE3; @ = 2
100 *LO. $A 8400
110 P."STOP TAPE __ NOW VERIFYING"'
120 F.B=S TO E S.4
130 IF !B<>!V; P.$7"FAILED AT#" &B" TYPE
    RUN TO TRY AGAIN"; E.
140 V=V+4; N.; P.$7"VERIFICATION COMPLETE"'
150 ?18=#29; E.
```

Program 1. Verify routine

BBCSOFT TAPE GIVES MUSIC AS YOU TOUCH-TYPE

Alan Pipes reviews one of the new BBC tapes, Vu-Type, produced with Pitmans at £16.10

THE best possible advice to give anyone taking up programming seriously (apart from don't) is learn to touch type. That's also true if you spend hours copying listings from magazines (*Acorn User*, of course).

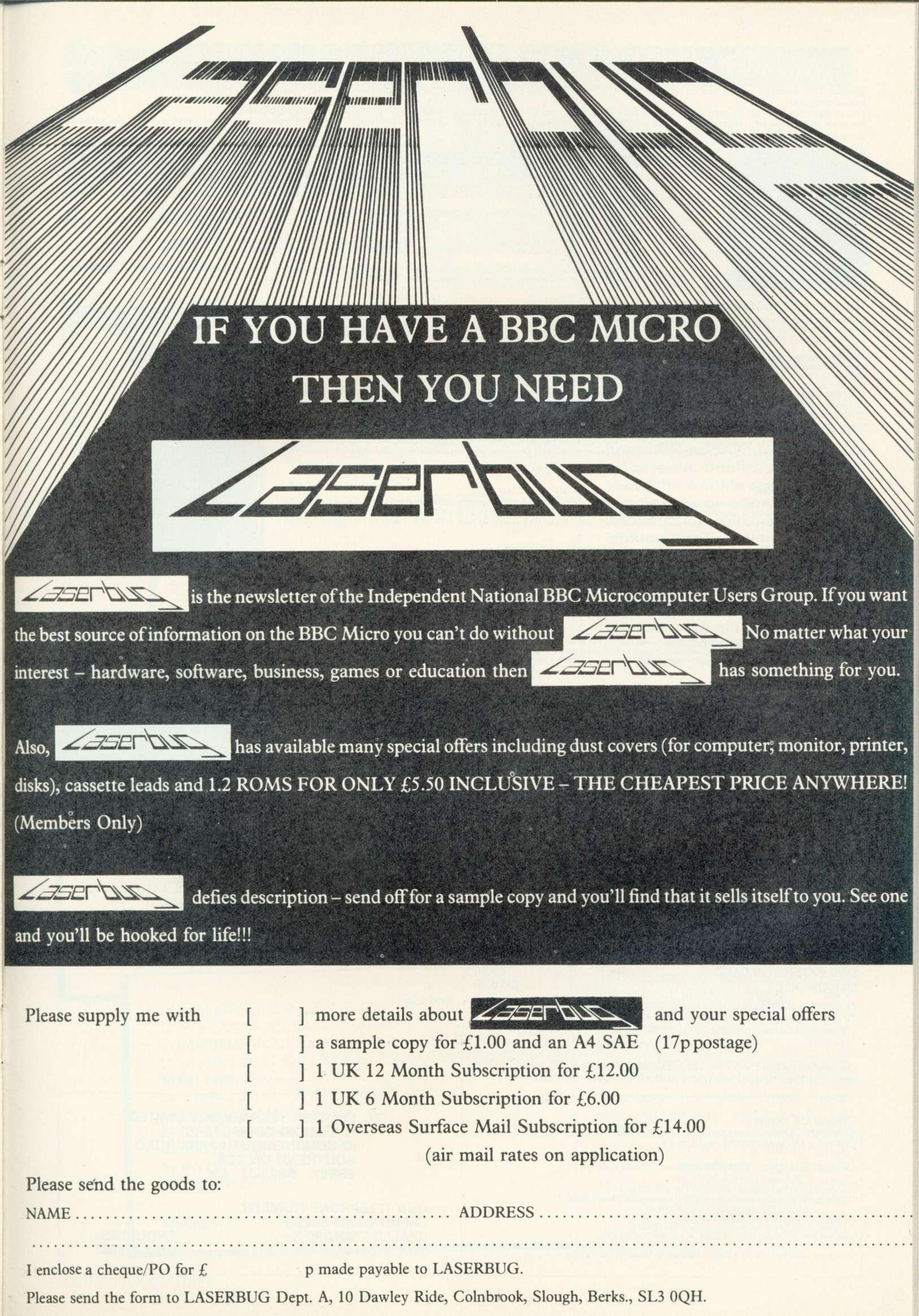
Despite ergonomic keypad salesmen and voice input researchers, the QWERTY keyboard is going to be around for some time – acting as both gateway and barrier to communication with the compuer. Ironic, isn't it, that the original layout of the keyboard was designed to slow mortals down, to stop them wrecking the fragile mechanisms of those early typewriters. Anyway, that's what we're stuck with. The question is how to make the most of it.

Vu-Type could be the answer. Journalists are notorious two-finger typists – some are actually proud of it. But being a progressive sort I've always fancied being able to type properly. Never having the time, inclination or cash to attend classes – and finding those teach-yourself notebooks useless – I opened *Vu-Type's* 56 page manual with some anticipation. Can you really learn to touch type at home?

It works. On the TV screen is a drawing of a keyboard. It can be displayed intwo colours or four – you can choose (the four-colour version is not that legible though). In a box at the top of the screen appear various exercises and drills – permutations of the right letters for each of your fingers at first, more complicated stuff later. The idea is not to look at your real keyboard (that's what 'touch' typing means) but at the screen, which tells you if you've pressed the right key or not. There are audible signals too of various kinds, and for the visually handicapped each key can be given a different musical note. (These can be switched off.)

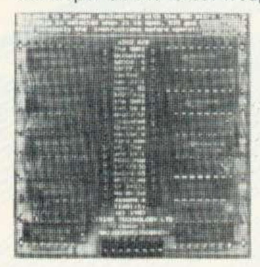
As you go along, the computer keeps track of your accuracy and speed (computers are good at this), and weights the drills to exercise your most error-prone fingers. And it maintains discipline – only letting you move on if you score an accuracy of 90 per cent or more.

The tape includes 23 exercises developed by Pitmans, some which throw in the BBC's control keys too – good news for programmers. The only problem is if you're not watching the keyboard you might hit break and bow the session!


IF YOU HAVE A BBC MICRO
THEN YOU NEED
Laserbug
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SWR DEVELOPMENT SYSTEM FOR THE BBC MICRO

Solidisk Technology Limited has unveiled at the ACORN SHOW an exclusive system to cut development time of any Side Way Rom (SWR) project on the BBC microcomputer.
The system consists of an emulator for the Side Way Rom, an Eprom Programmer/Manager and a set of utility Software.
An even more powerful instrument is the Solidisk 16 bit central processing unit. Connected directly to the BBC micro, the 16 bit system offers the software developer all the latest weaponry to do sophisticated work in days, not months.

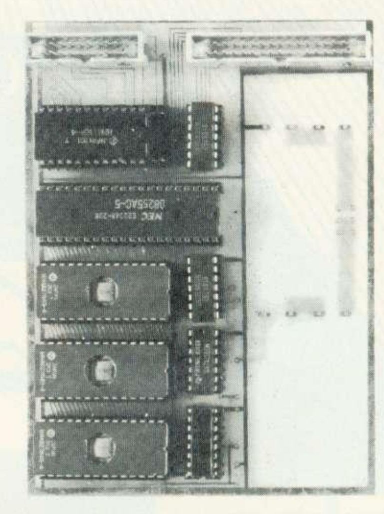


The Side Way Rom Emulator:

This unique piece of hardware is a 16k bytes of RAM which logically replaces the rightmost Side Way Rom. The Side Way RAM (or SWR 16, as we call it for short) is totally controlled by a register at location &FE30. Bits 0 and 1 select which SWR is to be accessed. When both set, bits 2 and 3 allow writing into the SWR. On power on, bits 2 and 3 are automatically set. You can load software from tape or disk with: *LOAD "PGM" 8000.
If the loaded program contains the 'signature' of a SWR, pressing Control Break will start your program.
From Basic, assembly of machine code can be done directly into the SWR16 if you set P%-&8000. Routines in the SWR16 can be easily accessed from Basic.
Installation of the SWR16 is very simple: remove the 6502 processor, install the SWR16 into the now empty processor socket, insert the 6502 into the reserved socket on the SWR16 and connect the control wires to the computer. Only 2 wires have to be soldered to the computer board.
The SWR can be exploited with graphice work such as 3D plotting, and drawing lists can be stored, manipulated etc.. in this memory.
The SWR16 extends effectively the BBC micro to 48k of RAM.

THE EPROM PROGRAMMER/MANAGER (EP/M):

The Eprom Programmer/Manager can program, copy, verify EPROMs, supervise all Side Way Rom switching and more. There is a special utility socket on the EP/M which accepts EPROMs or Hitachi's 6116 CMOS RAM. The utility chip resides in memory from &FCOO to &FDFO and is paged like the Side Way Roms. Up to 16 pages of 500 bytes can be programmed on a single EPROM and used in this socket.
The EP/M hardware is controlled by port B of the 6522 VIA (&FE60) Bits 4 to 7 control the utility page, and bits 0-3 extend the 24 programmable inputs/outputs of the 8255 PIA. The design allows maximum use of the hardware.
The system can store programs up to 48k long, accept any Side Way Rom and load it into the SWR16 or anywhere in RAM, control the RS423 interface and even the 'TUBE'!
The EP/M is connected to the BBC 1MHz bus and the user port with standard ribbon cables; No soldering work is involved. The system is completely self-contained and supplied with batteries capable of programming at least 100 EPROMs.
In effect, the EP/M can be considered to replace Acorn's serial processor for connection to ROM Cartridges.



THE SWR EXTENSION CARD:

ideal with "BEEBCALC", "WORDWISE", "VIEW" etc . . ., the Extension can be plugged into any SWR socket, accept up to 4 Side Way Roms and is very accessible. A 4 way switch block is used to select any ROM. The Extension is installed to the right hand side (outside) of the computer case.

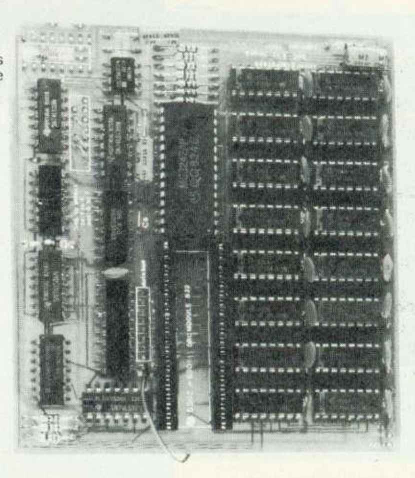
THE SILICON DISK:

Ideal as an extension if you have only a single disk drive. The Silicon disk is a 128k memory board, divided into 8 tracks of 16k and located in the shared area of Side Way Roms. Track No 0 is reserved to emulate SWR's or to store the S-DFS (see below). Tracks 0 to 7 store the memory image of a real floppy disk. Installation of the Silicon Disk is very simple with only 1 wire to be soldered to the computer board.

SOFTWARE:

BBC TOOLS (utility disk): a very complete disassembler and machine code monitor for the BBC micro.
3D-PLOT: any complicated shape can be broken down into simple DRAW and PLOT statements. The computer will then store all drawing parameters for a particular view angle in a disk file, calculate the next position, store the new parameters etc . . . Hidden line removal is very cleverly and automatically done. In the drawing phase, the computer will read back the disk file and re-draw your object. Drawing list of any particular object can be used in other programs. This utility could save a lot of time when writing games.

SILICON DISK FILING SYSTEM (S-DFS): the Silicon Disk (or the Side Way Rom Emulator) is treated as drive No 3. All disk commands and accesses will work with the Silicon Disk but with a tenfold increase in speed. You should consider buying the Silicon Disk before investing in a second drive. The S-DFS is included in the price of the 128k Silicon Disk.



STL 16 BIT CPU:

(Last minute apology: the system will be shown but we may not be able to demonstrate)
The STL-CPU is Solidisk's 16 bit personal computer without the keyboard and video monitor.

HARDWARE SPECIFICATIONS:

Central Processing Unit:
— INTEL 80186 — 16 bit microprocessor running at 6 MHz offering greater processing speed than any 8088 or 8086 system.
— On board 128k of RAM, directly expandable to 512K.
— 8k of Boot-ROM (expandable to 64k).
— 2 serial communication ports.
— Compatible with IBM's PC hardware add-ons. (Motherboard required).
Floppy Disks:
— Dual Double sided Double Density (640k bytes) 5.25" floppy disks.
— NEC 765A floppy disk Controller.
Dimensions:
—210 mm X 150 mm X 50 mm (excluding PSU).

SOFTWARE SPECIFICATION:

Operating system: industry standard CP/M-86 from DIGITAL RESEARCH

The STL-CPU is compatible, hardware and software, with the IBM's PC. Pascal, UCSD-p system, APL etc. can be purchased separately.

SUMMARY:

SWR16.-16k Ram module	£39.90
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THREE LISTINGS FOR GAMES

HERE are a couple of ideas that may be useful for games or adventures. The first, listing 1, produces a string of text which gradually appears, letter by letter, on the screen. The letters appear in their correct position, but randomly. Line 30 checks to make sure that you haven't already poked that character and line 35 makes sure the correct character is poked to the screen, since screen poke codes are different to ASCII codes. Line 45 contains an inbuilt delay, which may be altered to your requirements (see June's Forum).

The second, listing 2, does the opposite, gradually pokeing spaces into the displayed string. Note that, in both cases, the target string ($A) will, on completion, consist entirely of #FF so, if you want to use it again, you will have to assign it to another string before performing these routines.

LISTING 3 is a tip for games, such as Stock Market. It creates a ticker-tape style message across the screen. Note line 5 allocates $A to begin at #8200. This is to avoid dimensioning and allows the string to be of indefinite length. The rest of the program is easy to follow.

```
 5  REM Hidden text
10  DIMA32; PRINT$12
15  $A="THIS IS A SAMPLE OF HIDDEN TEXT"
20  M=LENA;T=#8020
25a R=A.R.%(LENA)
30  IFA?R=#FF GOTOa
35  IFA?R> 63 A?R=(A?R)-64
40  T?R=A?R; A?R=#FF; M=M-1
45  LINK # FB81; REM Delay
50  UNTIL M=0; END
```

Listing 1.

```
 5  REM Dissolving text
    (lines 10 to 20 as for hidden text)
25  FOR N=0 TO (M-1)
30  IFA?N<64 T?N=A?N; NEXT
35  T?N=(T?N)-64;NEXT
40  DO LINK, # FB81
45a R=A.R.%(LENA)
50  IFA?R=#FF GOTOa
55  T?R=32; A?R=#FF; M=M-1
60  UNTIL M=0; END
```

Listing 2.

```
 1 REM Moving teletype
 5 A=#8200;C=31;CLEAR 0;?#E1=0
10 $A="THIS IS A SAMPLE TELETYPE MESSAGE . . ."
15 $A+LENA="IT CAN BE AS LONG AS YOU LIKE . . ."
20 DO PRINT$30
25 FORB=1 TO C: PRINT" "; NEXT: O=0
30 DO PRINT$(A?O); O=O+1
35 IFO>30 A=A+1
40 UNTIL COLOUR>31; C=C+1
45 UNTILA?(O-1)=13
50 ?#E1=#80; END
```

Listing 3.

Barry Pickles hosts a new cash-for-tips column.

Here's a chance to show off your talents – and earn some crinkly green stuff into the bargain. There are reckoned to be some 40,000 of you out there and, bearing in mind that the Atom has been around for more than two years, you must have accumulated a fair amount of expertise.

What we're looking for are those little routines, tips and hardware mods you've discovered. Don't worry if your little wrinkle seems too simple – it's probably just what someone else has been looking for. The same rules apply here as in Ian Birnbaum's Beeb Forum. Short, sweet and as original as possible is the name of the game. I'll start you off, but this is your page, so let's hear from you!

Send your ideas to Atom Forum, Acorn User, 53 Bedford Square, London WC1B 3DZ. If you want it returned, enclose a SAE. It should be typed or printed, with programs on cassette (with listing if possible).

CAUTIONARY TALE OF BBC BASIC BOARD

HERE's a cautionary tale about the BBC Basic conversion card. As I mentioned in my original review (February, March issues), this board requires a fair bit of oomph to securely locate the connecting pins. Recently, I removed my board which meant replacing some ICs in their original sockets. What I found was that the steel pins used by the BBC card had completely ruined the retaining clips of the original sockets, with the result that the ICs tended to fall out! So, if you have this board fitted, either vow never to remove it, or mount it externally using DIL headers and ribbon cable. You have been warned!

£5 INCONVENIENT QUESTION by Mark Cytera

IT IS sometimes inconvenient to have a question mark printed after an INPUT statement. INPUT normally jumps to an interpreter subroutine at #CC81, which itself calls a subroutine at #CD09. This subroutine puts a ? character in the accumulator and prints it as a prompt. To alter this prompt, set Basic variable A to the ASCII value of the character you wish to use and enter the routine at #CD0B. If you don't want a prompt, set A equal to a dummy code, such as 22:

```
10  P."TYPE YOUR NAME:";
    A=22; LINK#CD0B
```

Anything subsequently typed at the keyboard is treated as an input string and stored in the string input buffer at #140, until a carriage return is met, or the buffer is full (64 characters). This string can be assigned to a string variable, in the normal way, after execution of this routine.

You will note we have used Basic variable A to pass a value to the accumulator. You can also do this with variables X and Y. In each case, it is the least significant byte of the variable that is passed. BBC Basic allows a similar method of passing parameters, using integer variables A%, X% and Y%.

To perform the same function in machine code, we must first use the subroutine at #F7D1, which prints all subsequent characters as ASCII, until a negative byte (eg NOP) is met. Thus:

```
(previous machine code) . . .
100  JSR#F7D1;]
110  $P="TYPE YOUR NAME:";
     P=P+LEN(P)
120  [NOP:LDA@22; JSR#CD0B
. . . (rest of machine code)
```

Note that P is the location centre. I am indebted to Mark cytera of Bristol for the prompt routine which earns him £5.

INVERTING THE SCREEN by Paul Wild £5

IN *Atomic Theory and Practice* a way of turning the screen white is given as:

```
FOR J = #8000 TO #9800
   STEP 4;!J=-1;NEXT
```

This loop is rather slow, so I have written a short machine code program to invert the screen (listing 4). This is not the same as the Basic program because it inverts the screen. Try experimenting with memory location #82 and poke different values into it, for examples ?#82=#FF.

The zero page locations are: #80, #81 is where the screen invert will start; #82 is the value to be EORed with the screen; #83 is the MSB of the last block of the screen.

Screen inversion was covered in July's Forum, but the Basic version I gave you is a bit slow and, for games this machine code is just the ticket. To assemble it to a different locations, alter the value of P in line 30.

WAY ROUND

* RUN CRASH

WITH ARRAYS

SEVERAL readers have sent tips for *RUNning Basic programs, using an execution address of #CE86. This is the normal *RUN address used by machine-code programs, but it has two drawbacks – it doesn't set TOP and will crash if your program dimensions arrays. However, if you use #F141 as an execution address, this will set the 'free space pointer' (#23,24) equal to TOP, so all you need do is make sure TOP is correctly set first. TOP is held in locations #0D,0E (least significant byte first), so make the first line of your program:

```
5 ?#D=#11; ?#E=#mm
```

then write the program as normal. *Do not run it.* When complete, check the value of TOP (ie PRINT&TOP) and edit line 5, replacing 11 with the LSB and mm with the MSB. Do this carefully, making sure not to insert extra spaces before the carriage return. Finally, check TOP again to ensure it still agrees with the values now in line 5. Once satisfied, save the program as follows:

```
*SAVE "(filename)"(start address)
   (end address) F141
```

It will now auto-run without problems. If you don't have any DIM statements, use #CE86, but still set TOP, as above.

```
 10 DIM LL(1)
 20 F.I=0 TO 1; LL(I)=-1;N.
    P.$21;F.I=0 TO 1;P=#2800
 40 [
 50 ;LLO LDY @0
 60 :LL1 LDA (#80),Y
 70 EOR # 82
 80 STA (#80),Y
 90 LDA # 80;ADC @1;STA#80
100 BNE LL1
110 INC #81;LDA#81
120 CMP #83;BNE LL1
130 RTS
140];N.;P.$6
150 REM EXAMPLE
160 !#80=#98FF8000:REM Set parameters
170 CLEAR 4
180 MOVE 0,0; DRAW 255, 191
190 LINK LLO
199 END
```

Listing 4. Screen inversion by Paul Wild

The professionals use

MICROTYPE

the accepted standard in typing tutors



So you have a Beeb! Which means you, and most likely those around you are going to spend a fair bit of time at the keyboard. Not only now, but for many years to come, as computers are most certainly here to stay.

So why not master the keyboard now? Stop chugging away with just a few fingers and your eyes for ever on the keys —learn to touch type.

Microytpe will allow you to teach yourself, and will improve as you improve. Just a few short sessions and you will see results. Keep at it for say half an hour a day and you will be 'touch' typing within a week—with no need to have to look at the keys ever again! Keep at it, and speed will follow.

Apart from simple working instructions and a finger position chart, everythng is actually shown on the screen——you don't have to wade through a printed course. You will be given the characters to type on the screen and will be shown which are being keyed in correctly and which are not.

At the start you will be given the 'home' keys to practice, but unlike normal typing tutors, the computer can compute on which keys you are inaccurate or slow and so can give more practice on these keys, whilst replacing those on which you are proficient.

There is also the choice of either practice mode or paragraph mode. So once the program has given, and you have learned, most of the keys, paragraphs can be attempted.

There are ten short exercises in each lesson, with a complete alalysis of your performance at the end. This includes your average typing speed, accuracy and the keys mis-keyed. If the response time is set, the program will also show the keys on which the response time was exceeded.

Being designed for micro keying, a great many of the words selected are those which are actually used in programming the BBC. But of course it is also ideal as a normal typewriter typing tutor, as both computer and typewriter keyboard layout is the same.

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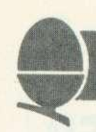
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MAKING MUSIC WITH INTERRUPTS by Mark Dove £20

I KNOW from my own computer club members how many micro owners are interested in making music. *Acorn User* has covered the subject pretty thoroughly (May and July issues), but I can't resist including a very neat routine, from Mark Dove of Sutton Coldfield, which uses the VIA as a frequency generator and turns the Atom into a musical keyboard, with a range of just over 1½ octaves.

Listing 5 uses timer-1 to generate a stream of interrupts, each of which causes a click on the loudspeaker. This leaves the Atom free to run a program, and the one included turns the Atom into a simple keyboard. So what? you ask, there's one in the manual. Well, with interrupt-driven sound, the sound will continue for as long as the key is held down.

The included program sets up the keyboard with middle C on key A, and C# on W.

The important part of the program is lines 10-130. If these are typed in then:

LINK BB1 – will initialize interrupts after break
LINK BB0 – will turn sound off
LINK BB3 – will turn sound on
?#B807 – (1-255) Coarse tuning
?#B806 = (0-255) Fine tuning

This delightful program earns Mark £20. As the final word on this subject, interested users who have fitted the VIA, are recommended to send for a listing of the Organ program, price 50p (plus SAE) from the; national Atom Users Group, 18 Frankwell Drive, Potters Green, Coventry CV2 2FB. Written by Paul Beverley, it gives a very fair imitation of a Hammond organ.

```
 10 DIMAA59,BB5;FORF=0TO5;BBF=256;NEXT
 20 PRINT$21;FORF=1TO2;P=#28C0
 30[
 40:BB0 SEI;RTS
 50:BB1 LDA@(BB4/256);STA#205;LDA@(BB4%256);STA#204
 60 LDA@64;STA#B80B;LDA@255;LDX@3
 70:BB2 STA#B804,X;DEX;BPL BB2
 80 LDA@192;STA#B80E
 90:BB3 CLI;RTS
100:BB4 LDA@127;STA#B80D;LDA#B002
110 EOR@4;STA#B002;PLA;RTI
120]
130 NEXT
140 P=#81;[JSR#FE71;STY#80;RTS;];PRINT$6
150 FORF=0TO59;AAF=-1;NEXT
160 AA1=1432;AA2=1351;AA3=1276;AA13=1136;AA15=1204;AA27=1517
170 AA33=3830;AA36=3034;AA37=3214;AA38=2864;AA39=2551;AA40=2273
180 AA42=2025;AA43=1911;AA44=1703;AA47=1804;AA48=1607;AA51=3405
190 AA52=2703;AA53=2145;AA55=3608;AA57=2408
200 LINK BB1
210 LINK BB0;DO LINK#81;UNTIL?#80<>255;A=?#80
220 ?#B807=AA(?#80)/256
230 ?#B806=AA(?#80)
240 LINK BB3
250 DO LINK#81;UNTIL?#80<>A
260 GOTO210
```

Listing 5. Interrupt-driven sound and keyboard



ROM ROUTINES

PETER Blenkisop of Garston sent in a long list of useful addresses in the Atom ROM, some of which are printed here. As I've said before, using ROM routines makes coding efficient. However, *Splitting the Atom* from Procyon gives details of most of them, so I'm going to set some ground rules:

- the routine must not have been published in *Acorn User*
- check the Atom manual first – it may already be in there!
- unless the routine is self-explanatory, then to make sure that you understand it and thus that other readers will, you should include a short demonstration program. All registers used should be specified along with any special entry conditions. Some routines may *only* be used in machine code – this should be noted.

The routines are given in table 1 and have all numbers in hex format.

C2F2	interpreter entry address. In page zero, 5 and 6 contain the start of the Basic program
C4F6	later entry. Stack not cleared so loops still intact
CA4C	increment COUNT. Then go to output routine
F7FD	prints a space
F802	prints accumulator contents as two hex numbers
F893	changes ASCII characters in the input buffer (0100) to hex address. X register must contain zero page address, and then this address and address +1 hold hex address
F8EF	check buffer contents for operating system command eg *CAT
FC38	if carry flag set, print 'play tape', if clear 'record tape'
FC40	print 'rewind tape'
FC7C	save byte in accumulator to tape
FD1C	sound output to speaker. Accumulator must contain a number with second digit 4 or 5
FD44	invert at cursor position
FD69	clear VDU, and home cursor. Same as P.$12
FD74	fill screen with 40 (hex). Home cursor
FD7D	home cursor
FE08	move screen up one line
FE55	send accumulator to VDU only
FEFB	send accumulator to printer only

Table 1. ROM routines from Peter Blenkinsop



VIRGIN VAMP

■ Bugbomb, Virgin, BBC B, £7.95
■ Landfall, Virgin, BBC B, £7.95
■ Space Adventure, Virgin, BBC B, £7.95

AFTER the record hype, the computer games hype. Virgin's first three games are frankly disappointing.

Bugbomb, by Simon Birrell, is a reflex game. Your man (Henry) is chased through a grid maze by gun-firing bugs. You can eliminate them by dropping bombs from behind, which follow you and bounce back and forth along the rows or columns until they hit a bug – or you bump into one by mistake. You can only have three bombs on the go at once (a fact not given in the instructions). Once you clear screen 1, which is fast, you go onto a fuller screen 2, which is very fast. Strictly for reflex merchants.

Landfall is a rather sophisticated lunar lander (yawn!). Written by Gregory Trezise, it gives you a target screen plus stacks of dials and controls to watch. You have just enough fuel – use too much to slow the ship down and the motors burn up, switch off the motors and the whole ship will burn up. Verdict: save up for a flight simulator.

Space Adventure is the best of the bunch. Written by Andrew and Roger Thomas, it has been around for a while now, under an independant label, as they say in the record trade. It's a cross between a maze-type adventure and an arcade action game. You have to search a spaceship for keys to locked rooms that contain crystals.

On the way you meet some aggressive robots shooting from the hip. Every time you're hit, your life support goes down. But you can shoot back with a phaser or the more powerful, but energy consuming, blaster. You can't leave a room and move on unless you kill the robots. You can charge up every now and again with strategically placed power packs. At each end of the ship is a transporter room that takes you to the opposite end or onto a different level. A little map below the action window shows you where you are. This is an absorbing game, but not one to play when friends are round – it takes ages to complete.

Another gripe. Why didn't Virgin improve the cosmetics and standardise on keys? *Bugbomb* uses Z and X for left and right plus: and / for up and down; *Space Adventure* uses the next keys along (; and .) for up and down. Better still why not have reconfigurable keys, like on Program Power's Moonraider?

Since the noisy launch of Virgin Games, at a leafy nightclub by a Margaret Thatcher impersonator, Virgin have been notably quiet. Can it be they're already bored with their own games?

Alan Pipes

GRACE IN SPACE

■ Meteors, Acornsoft, BBC B, £9.95

THIS is the arcade classic *Asteroids*, the one after *Space Invaders* and before *Pacman*. It has the outstanding virtue of being simple to play and the graceful graphics are a joy to watch.

You're in the ship centre screen and all you have to do is blast the asteroids that are drifting at you slowly through space. But the big ones break into faster small ones until they're completely eliminated. Then there are the saucers that fly erratically by with all guns firing. Watch out for the vicious small ones! You can rotate your ship, or set it in motion to chase the rocks. If you're really desperate there's a hyperspace button, too. A must for everyone's software library.

Alan Pipes

ACE TO FACE

■ Dogfight, BBC 32k (any OS), Opus Supplies, £8.95

FANCY yourself as a World War I flying ace? *Dogfight* is a two-player game using keyboard or joysticks that gives you the chance to be a terror of the skies. The object of the game is to shoot down your opponent's plane before the ammunition runs out . . . or he gets you.

When the game begins, the planes are already in the sky, unlike the arcade version, and you control the speed and direction of the plane as well as firing your machine gun. A cloud slowly scrolls across the screen issuing frequent bolts of lightning and you have an impressive choice of options and difficulty levels.

There are nice effects like a plane catching fire and leaving a smoke trail, and an excellent 'cinema-screen' introduction with a scrolling narrative accompanied by well thought-out music. However, the game suffers in certain areas. No routine exists to detect collisions and when the planes go off screen, they re-appear in the middle! This is supposed to simulate 'flying out of the sun' but I would have preferred a wrap-around screen.

The key layout is awkward and the game is more suitable for joysticks. The choice of the shift-lock key as a fire button seems illogical as this causes the shift lock light to repeatedly go on and off, which can't do the diode much good.

However, I found this game enjoyable and a refreshing alternative to the over-played space-invader types. It should provide many hours of entertainment.

Jeremy Vine

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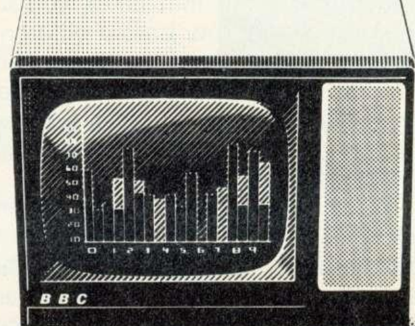
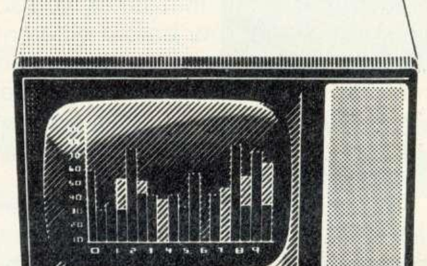
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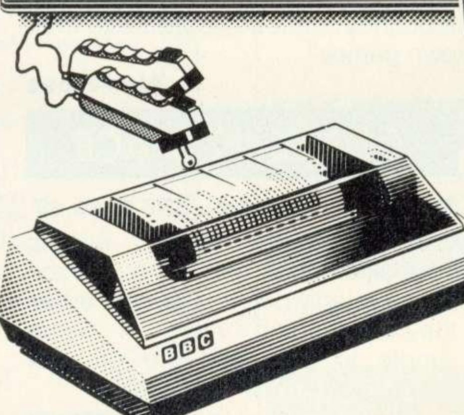
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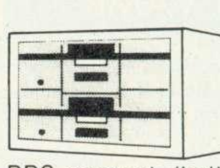
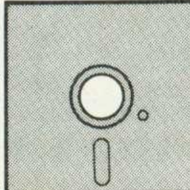





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George Hill finds software control is a major advantage with Epson FX80 dot-matrix printer

GOODIES GALORE ON EXCELLENT EPSON

THE latest and most impressive in the Epson range of dot-matrix printers is the FX80. This remarkable printer costs roughly the same as its predecessor the MX80, and even if it is a little more, it's well worth it. Don't be tempted into buying an end-of-range MX80 unless at a much reduced price.

All the features on the old MX80 have identical commands on the FX80. So any program written to operate on the old printer will operate on the FX80, including graphics dumps.

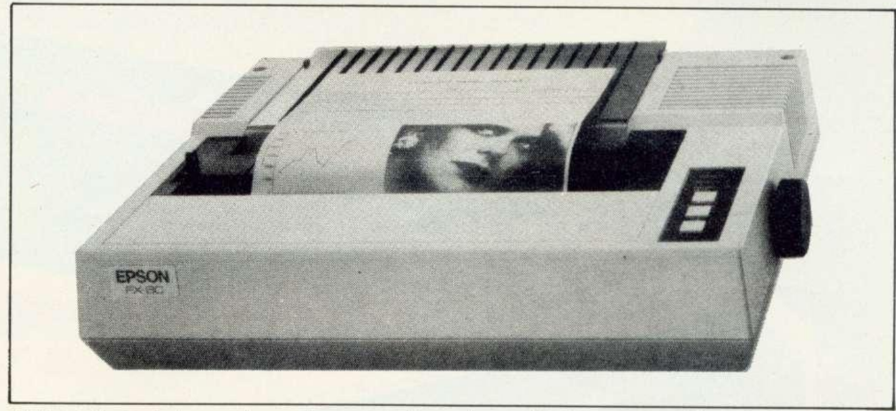
Now what are the extra goodies?

The printing speed is increased to a maximum of 160 characters per second. This is faster than the competition and the home or small-business user is unlikely to need anything faster. There is a claimed 1920 dots per line, though this is really 1920 dot positions per line, as adjacent dots cannot be printed. It does give rise to good-looking characters though.

A reverse linefeed is available, allowing graph-plotter type functions with suitable programming.

There are two different typefaces. Pica and Elite (figure 1). Both have the option of italic characters. The Pica style is selected when you switch on (the default), and has the option of 'proportional spacing'. This means narrow letters (l or i) take up less space than wide letters (w, m, etc). This gives an attractive and true 'letter quality' print look to letters and documents. (Though I find the Centronics 739 characters more pleasing.) Program listings are still better in normal spacing, otherwise the line-numbers and starts of the lines fail to fall into columns.

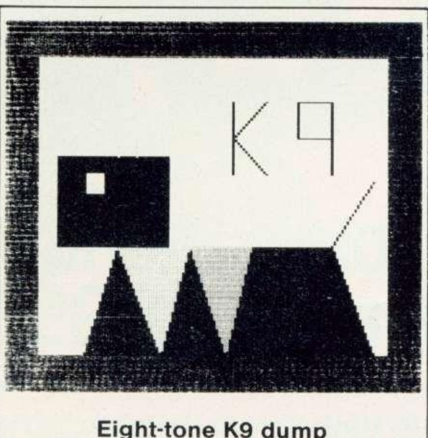
There is such a wide variety of graphics modes available it is difficult to imagine a use for most of them. They seem to derive from all the possible character modes. Most important is that the CRT graphics mode cures the 'Epson problem' – the inability to print a round circle in a simple on/off dump. The results of some of the different styles is shown for comparison in figure 2. Beware of the claimed 1920 dots per line. As in the characters, you cannot print adjacent dots on the same line.



Finally, there is the 'download character generator'. This marvellous idea alls you to transfer the complete character set from ROM into an on-board RAM, where you can re-define any or all of the characters. This means special characters (eg the equilibrium sign and the arrow in the chemical equations of figure 1) can be built up and used at will. You could even define a complete Greek or Japanese alphabet. A word of warning! The coding necessary to define these characters is (perhaps necessarily) complex.

Strangely, though this Epson will not print double-height characters, and you can only have proportional spacing in the emphasised Pica typeface.

The Epson's enormous advantage is that everything is under software-control. Every function can be initiated, stopped and changed from inside a program, or from the keyboard. A consequence of this is a large and complex set of escape sequences and control codes. Epson have managed them very well, and mostly ESCape + one to three bytes cause the necessary reaction.



Eight-tone K9 dump

This brings us to the manual, which is a vast improvement on previous Epson translations. The layout is clear and attractive and explanations are reasonably clear, though some of the functions are so complex that a simple explanation in a few words is not possible. The worst section concerns loading the paper, where technical terms like 'platen' are introduced without explanation. The instruction 'Turn the scale toward the front of the printer to detach it from the platen' bears no relationship at all to what is actually done! (The platen is the roller which holds the paper for the printhead to strike against.)

The escape sequences are presented in ASCII order of characters, which is not always the logical order for their explanation. There are so many codes that it is impossible to use the full listings to look up a particular function. You naturally turn to the alphabetical index. But horrors, there isn't one! The only reference source is appendix H, a brief summary of codes, broken down into categories. Since this is three pages long, it

can still be difficult to look up, say, underlining.

The manual does, however contain a set of lessons on the use of the character generator, and a generous helping of example programs (all in LPRINT terms) where relevant.

Has this marvel of Japanese wizardry any disadvantages?

Of course! Feeding in fan-fold paper is a nightmare. The sprockets never seem to match the holes in the paper, whether you follow the instructions or not. The setting of the DIP (dual in-line package) switches no longer allows you to select paper-length, so you have to send a control code before you can use the form-feed with 12in paper. Also the characters are a trifle 'square' for my taste.

Against this, you no longer have to dismantle the machine to change DIP switch settings, even with the serial board fitted. They are under a neat panel at the side. Also the printer, though a bit longer, is flatter, and the paper-feed mechanism does not protrude, giving it a more attractive look.

My summary? Brilliant.

Program 1 is a graphics procedure to print an ellipse, of any radius, eccentricity and colour (eccentricity=1 gives a circle). For fellow users of Wordwise, I offer program 2 to make the SHIFT-CONTROL-function keys perform the functions printed on the strip. I use it as part of my !BOOT program, which says:

```
1CHAIN"KEYS"
2*WORDWISE
```

Tape users would just CHAIN"KEYS" before switching into Wordwise.

Figure 1 of Doctor Who's best friend K9 was designed by my daughter Miranda to show off my eight-tone graphics dump which takes less than three minutes on this printer.

Subscripts ,superscripts and download characters

$2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$

$N_2 + 3H_2 \rightleftharpoons 2NH_3$

$(a + b)^2 = a^2 + 2ab + b^2$

This is to illustrate the normal print style

THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG
The quick brown fox jumps over the lazy dog

Now the elite-style printing

THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG
The quick brown fox jumps over the lazy dog

Now in proportional spacing

THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG
The quick brown fox jumps over the lazy dog

Alternate character set - this means italics

Italics and standard in pica (normal) style
Italics and standard in elite style
***Italics and* standard in proportional spacing**

Any word or letter may be underlined in any style

All types **of print** and graphics

can be mixed on one line

Figure 1. Versatile character faces

FOR those not familiar with it, here is a brief list of the capabilities of the MX80, all of which are shared by the FX80.

- **Printing up to 960 dots per line and 80 characters per second.**
- **Handles tractor feed or pressure feed paper. Roll holder extra if required.**
- **Horizontal and vertical tab, form-feed, variable linefeed, backspace, skip-over page-perforation.**
- **Condensed, enlarged, emphasised, double-strike characters, and almost any combination.**
- **International character sets.**
- **Sub- and super-scripts, underlining. Two different graphics modes of 480 and 960 dots per line respectively.**

480 dots per line   CRT graphics   Plotter graphics
960 dots per line   CRT II graphics

Figure 2. Wide range of graphics modes



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```
   10 REM ELLIPSE
   20 REM To draw an ellipse at any poi
nt
   30 REM of stated radius, eccentricit
y, and colour.
   40 REM Move to centre before drawing
.
   50 MODE1
   60 MOVE300,800
   70 PROCellipse(200,1,2)
   80 MOVE300,300
   90 PROCellipse(200,0.5,1)
  100 MOVE900,300
  110 PROCellipse(200,1.4,2)
  120 MOVE900,800
  130 PROCellipse(100,0.3,3)
  140 END
  150 DEFPROCellipse(radius,eccentricit
y,colour)
  160 PLOT0,-1*radius,0
  170 FOR X=-1*radius TO radius STEP 4
  180 Y=INT(eccentricity*SQR(radius^2-X
^2))
  190 GCOL0,colour
  200 PLOT0,4,Y
  210 PLOT1,0,-2*Y
  220 PLOT0,0,Y
  230 NEXT
  240 ENDPROC

  250 REM for MODE0, change step size t
o 2 at lines 150 and 180,
  260 REM for MODE2 change to 8 at 150,
 180
```

Program 1. To print ellipse

```
   10 REM FXKEYS
   20 REM For use with WORDWISE
   30 REM paragraph
   40 *KEY0|M|!!TI6|!"
   50 REM delete line
   60 *KEY1|!|L|!#|!|.|!|L|!#|!'

   70 REM switch on and off proportiona
l spacing
   80 REM (doubles as emphasised charac
ters)
   90 *KEY2|!!OC27,112,49|!"
  100 *KEY3|!!OC27,112,48|!"

  110 REM switch on and off underlining
  120 *KEY4|!!OC27,45,49|!"
  130 *KEY5|!!OC27,45,48|!"

  140 REM Elite
  150 *KEY6|!!OC27,77|!"

  160 REM Pica
  170 *KEY7|!!OC27,80|!"
  180 REM Italics on and off
  190 *KEY8|!!OC27,52|!"
  200 *KEY9|!!OC27,53|!"
```

Program 2. FX80 utilities for Wordwisers. Overlay strip slots above normal version

```
   10 REM CHEMALG
   20 REM to print chemical and algebra
 equations using the EPSON FX80 printer
.
   30 REM G.B.Hill (c) 1983
   40 REM select download characters.

   45 VDU2
   50 VDU1,27,1,ASC":",1,0,1,0,1,0
   60 VDU1,27,1,ASC"6"
   70 VDU1,27,1,ASC"%",1,1,1,0

   80 REM define characters 189 and 190
   90 VDU1,27,1,ASC"&",1,0,1,189,1,190

  100 REM equilibrium sign codes
  110 VDU1,139,1,8,1,0,1,8,1,0,1,8,1,0,
1,8,1,0,1,42,1,20,1,8

  120 REM arrow codes
  130 VDU1,139,1,20,1,2,1,21,1,0,1,20,1
,0,1,20,1,0,1,84,1,32,1,20

  140 REM In PROCchemistry if a number
is required ON the line rather than as
a subscript it must be preceded by an ^
  150  equation1$="^2NaOH + H2SO4 "+CHR
$189+" Na2SO4 + ^2H2O"
  160  equation2$="N2 + ^3H2 "+CHR$190+
" ^2NH3"

  170 REM In PROCalgebra the ^ precedes
 a character to be printed as a supersc
ript
  180  algebra$="(a + b)^2 = a^2 + 2ab
+ b^2"
  190 PROCchemistry(equation1$)
  200 PRINT
  210 PROCchemistry(equation2$)
  220 PRINT
  230 PROCalgebra(algebra$)
  235 VDU3
  240 END

  250 DEFPROCchemistry(a$)
  260 VDU1,27,1,ASC"E"
  270 FOR I=1 TO LEN a$
  280 b$=MID$(a$,I,1)
  290 IF b$="^" THEN b$=MID$(a$,I+1,1):
PRINTb$;:I=I+1:NEXT
  300  IF ASCb$>47 AND ASCb$<58 THEN VD
U1,27,1,ASC"S",1,1:PRINTb$;:VDU1,27,1,A
SC"T" ELSE PRINTb$;

  310 NEXT
  320 PRINT
  330 ENDPROC
  340 DEFPROCalgebra(a$)
  350 FOR I=1 TO LENa$
  360 b$=MID$(a$,I,1)
  370 IF b$="^" THEN b$=MID$(a$,I+1,1):
VDU1,27,1,ASC"S",1,0:PRINTb$;:VDU1,27,1
,ASC"T":I=I+1 ELSE PRINTb$;

  380 NEXT
  390 PRINT
  400 ENDPROC
```

Program 3. Produces equations on FX80 (see figure 1)

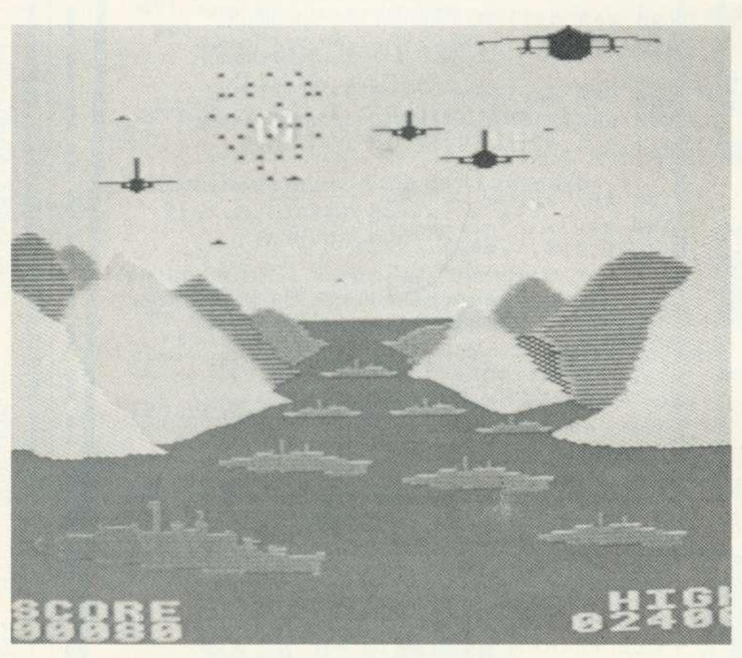
Paragraph	Delete line	Proportional spacing ON	Proportional spacing OFF	Underlining ON	Underlining OFF	Elite	Pica	Italics ON	Italics OFF	SHIFT-CONTROL function keys

SOFTWARE INVASION

PRESENTS

3D BOMB ALLEY

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Imagine the formidable task of protecting a fleet of ships in a small stretch of water, with relentlessly attacking fighters dropping deadly screaming bombs all around you. Your only protection is a battery of ground to air missiles to blast them from the sky, causing a cascade of light and an earth shattering explosion, leaving devastation in it's wake. All action takes place in the third dimension, including the sound effects, and the graphics are to our usual high standard. The game includes a joystick option, switchable sound and a freeze game facility.

If you liked Gunsmoke you won't want to miss this one!

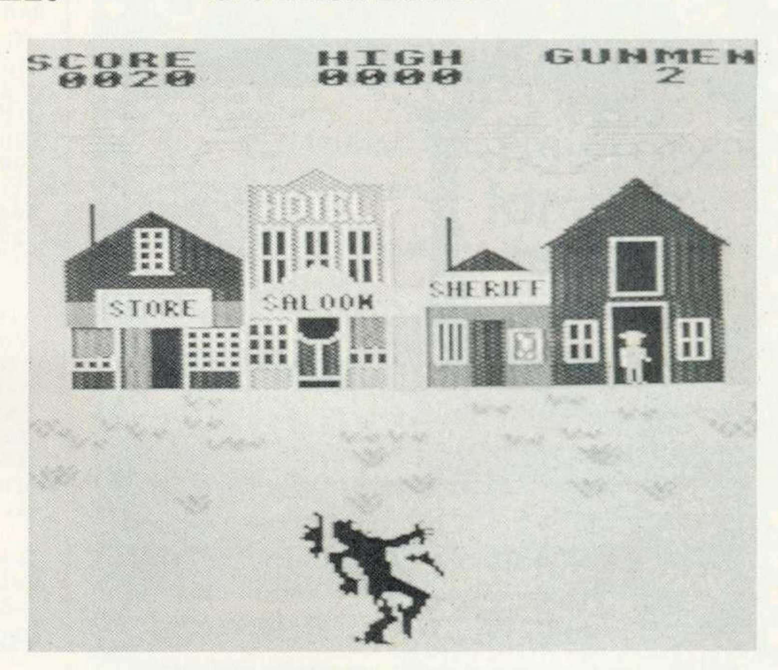
A graphic adventure for your BBC micro model B for just £7.95 inclusive.

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GUNSMOKE runs on a BBC micro model B for just £7.95 inclusive.



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TELETEXT FOR YOUR MICRO

Malcolm Hall takes a good look at Acorn's teletext adapter – and explains the concepts of teletext, Prestel and telesoftware

TELETEXT, along with the video recorder, is what all TV viewers should have according to the BBC, IBA and retailers. Ever since the BBC micro was first announced, the teletext system has been promised and here it is. Both BBC and IBA now have teletext services on all four channels. Each calls its service by a different name. The BBC service is Ceefax and the IBA's Oracle.

Teletext pages carry all types of information, from sport and financial through details of television programmes and news to puzzles and general information. Oracle now also includes adverts. For those of you not familiar with teletext, an outline of the system and a description of British Telecom's Prestel will help.

Both types of service, on TV and phone, are available to the public, and allow information to be received electronically. The user can request a page of information to be displayed on a television screen for reading. The item to be shown is selected by keying a unique page number.

From here on the systems are vastly different. Briefly, and without really doing justice to either, I will outline some of the differences.

Prestel sends pages over normal telephone lines, while teletext pages are sent together with the television programmes – more about this later. Because of this, amongst other reasons, the time delay before a page is displayed is about a second for Prestel while for teletext it could be 30.

Prestel is a two-way system which enables the ;user to send information back to the source – useful for ordering bottles of wine or sending messages to other users. Teletext is a read-only system. For readers to send information back they must write a letter or use the telephone. Prestel has many hundreds of thousands of pages available, while teletext has only hundreds of pages.

Finally, Prestel costs money to use. Obviously there are telephone connect charges and certain pages have a charge on them which is made when the page is read. Teletext however is free, apart from the initial cost of the adapter.

For those interested in Prestel, several adapters (called modems or acoustic couplers) are available for the BBC micro – Acorn has one under development.

As mentioned previously, teletext pages are broadcast together with the normal television picture. When a picture is received by a television set it is shown on the screen as a series of horizontal lines. Have a close look at your picture. Each picture consists of approximately 650 lines. However, not all these lines are shown on the screen, and so as far as the broadcasters are concerned these are wasted space. This is like magazine publishers having to leaves margins around the edges of their pages. The broadcasters have used these extra lines to send teletext pages by coding them onto the unused lines. If you want to see some of these coded lines, adjust the height of your television picture and some lines of flashing dots will appear at the top of the screen – that is the teletext coding.

To show the pages on the screen a decoder is required. These are now appearing in most new television sets and are controlled through a remote control keypad. Since it is not possible to send all the pages at once, they are sent one at a time in rotation. This in a way limits the number of pages available on each channel since too many pages may mean the user having to wait far too long for a page to cycle round. When the user selects a page, the decoder waits for it to come on the television signal and then displays it. The time delay obviously depends on which page is being sent at that moment, especially if the page selected has just passed. Some popular pages, such as index pages, are sent more than once in the whole sequence to shorten the waiting time.

Now to the BBC micro teletext system. Using a computer to decode teletext pages is more powerful than a built-in TV decoder. The first advantage is being able to save a series of pages to the computer's memory or to disc, and retrieve them later at a much faster rate than directly from the television signal. Other advantages include being able to retrieve computer programs – telesoftware – or use the teletext information within programs.

The teletext adapter, which is a receiver and decoder, is contained in a case the same shape as the BBC micro itself, though about half the width (the same as the second processors). The teletext adapter is connected to the 1 MHz bus and has its own mains power supply. Finally, the decoder must have an aerial connected. Connecting the aerial to the teletext adapter does not mean the normal television picture can be shown on the computer screen, only the decoded teletext pages.

The aerial seems to be the main problem with the adapter since teletext is very sensitive to bad reception. A good roof or loft aerial will be needed as an indoor aerial will just not work. The manual which comes with the adapter lists a page of problems which could occur.

Overall, the problem is knowing if the adapter will work at home before spending your hard-earnt money. Basically, your reception should give a good quality colour picture with no 'snow', or 'ghosting' where a very faint second picture can be seen. This must be checked on all the channels since reception varies for each. The 'ghosting' gave me many problems causing pages to be received with errors on them. Although I live only a few miles

from the main Crystal Palace transmitter in London, there are several buildings and a hill which produce faint 'ghosting' in what is otherwise a good reception area.

Now into the BBC micro we go, where the teletext ROM must be inserted, and a 1.0 operation system.

Four thumbwheels under the adapter are used to tune channels. Tuning is achieved using part of the system software which displays a signal strength meter.

Now to the software, which can make or break any system. It allows the system to be used in three modes.

The simplest, terminal mode, turns the Beeb into an intelligent teletext decoder allowing pages to be displayed, using the function keys. In this mode all the normal teletext facilities are available as well as the ability to save and re-load pages to a file. With most teletext systems only one page may be displayed at any one time and when another page is selected you must wait for it to be received. However, the BBC system can request a page to be kept in memory. Keeping a page means that when it is next received by the Teletext adapter, even while you are displaying another page, it will be updated. If a kept page is selected it can be displayed immediately. In terminal mode it is also possible to simply load telesoftware programs for running or saving.

The telesoftware mode is effectively another filing system and allows programs and pages to be loaded from the teletext pages. This is achieved through a series of operating system commands.

Telesoftware is a technique which enables software to be sent on a series of normal teletext pages. This is achieved by coding the program in such a way that it can be writen onto a normal teletext page. A program will not fit onto one teletext page, so telesoftware uses 'rolling pages'. With these the page contents are different the next time the page is received. Rolling pages are usually used when several pages of similar information must be read in sequence. The only problem is that when the page is requested the first page displayed could be anywhere in the sequence.

Loading a program for teletext is simply achieved by selecting the page containing the program and issuing a command to load the program into memory. It can then be saved or executed immediately. I found loading telesoftware programs much more sensitive to bad reception than normal Ceefax pages since just one error can cause the program to be rejected.

Using telesoftwae to distribute programs is not only cheap, since it will obviously be free, but allows programs to be updated easily when modifications are required, or to supply updated data. Programs could be transmitted alongside TV programs to allow a limited viewer interaction.

Hopefully, the software will be good quality, though the quality of much telesoftware available on Prestel and Ceefax leaves a lot to be desired. This may be a problem, since the software suppliers will not receive any income unless it comes from the BBC or indirectly from sales of associated books. The BBC says it will increase the number of programs broadcast, but at any one time only a few will be available. These, however, will be changed at regular intervals.

Whilst in telesoftware mode, other commands allow you to control the adapter. For example, to change the channel to BBC 1 and display page 700 (the telesoftware index page), the following commands are required:

```
*TELESOFT
*BBC1
*PAGE 700
*TRANSFER 7000
*DISPLAY 7000
```

Using these commands puts the BBC micro into telesoftware mode, selects the channel and page, and then transfers the page to memory and displays the page in memory. Other commands allow the date and time to be displayed. These always appear on the top line of the teletext pages.

In the final mode of using the teletext software, all the teletext routines are made available from assembly language or Basic programs. These routines allow the programmer to use the teletext information from the broadcast signal and control the adapter. For example, a program for keeping records of your vast share holdings could use up-to-date stock market figures as data.

The system manual gives enough technical information for these programs to be written, together with a full description of the telesoftware coding. For the more simple uses of the system the manual provides the user with all the information required to connect up and use the system, and it is not difficult to use. All the problems I had were due to 'ghosting' and not reading the pre-release notes properly.

In conclusion, the telesoftware facilities offered by the teletext adapter will be a valuable addition to the BBC micro system, although the £200 price tag might deter some customers. It is expensive if the adapter is to be used simply as a teletext receiver, especially if you are about to buy a new TV, when a built-in system would be better value – although it couldn't decode telesoftware.

The launch of the BBC's telesoftware service on Ceefax creates a second major source of telesoftware – programs to download directly into a micro's memory – and access to information on a data base. The first source is Prestel where Micronet and Viewfax 258 are already operating through telephone modems.

The advantage of Prestel is a lower initial cost, and a larger database: the big disadvantage is the telephone bill.

Teletext is made possible by Acorn's new adapter – but it costs £200. However, all the software is free, and it gives access to Ceefax and Oracle.

The BBC's problem is finding software – it can't be paid for, as viewers can't be charged, and large funds are unlikely to be made available from the TV licence fee. Also the amount of software available at any one time is limited.

However, Auntie undoubtedly has a few tricks up her sleeve – and the name BBC is probably the biggest advantage over British Telecom.



Magic
PRESENTS
The Ghosts of Grunley Grammar
A brand new fantasy quiz game written for the BBC micro. Your task is to make your way through the different classrooms of an old school, now haunted by its old masters. These question-happy ghostly masters can be beaten by a combination of luck, skill and a good memory. And you're against the clock all the way. "Ghosts of Grunley Grammar" is magic to play (and it improves your general knowledge as well).
★ For BBC model B, or model A with 32K. Works on all operating modes 0.1 to 1.2.
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State clearly for which micro when ordering
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Joe Telford finds teething problems only drawback to handy 400k drives

ACROBATIC SLIMLINE DISC DRIVES

400k, double-sided, 80-track slimline disc drives, from Microage Electronics, £399 inc VAT, manual, utilities disc, interface cable

AS OUR friendly editor always says, good things come in small parcels, and so it was with some anticipation that I looked forward to the delivery of a slimline disc unit from Microage. Carefully packed and undented by the post, a wonderfully small drive (230 x 150 x 50mm) arrived at Telford Towers.

Weighing in at 1700g, the drive came complete with leads, manual, and utilities disc. Once unwrapped, the power lead was attached to my BBC micro's power supply, and the interface lead connected underneath the Beeb. The length of these leads meant there was no trouble placing the drive anywhere around my micro.

I had just finished admiring the drive's grey cover, when I suddenly realised the documentation didn't specify whether the machine was 40 or 80 track, single or double-sided. Examination of the utilities disc showed it was in fact an 80-track machine. In addition, I could read the catalogue (*.) on both sides. This little package could actually hold 400k (approx. 100 sides of A4) of information.

One problem was that the drive door spring on my model was weak, and the door regularly opened ejecting the disc, often during a read/write operation. This was cured by retensioning the spring, a task made less easy by Microage sticking rubber feet over the casing screw holes. The interesting positioning of the drive feet (because of the screw holes) meant that pressure on the door caused the drive to dip its head and attempt handstands. Once the rubber feet were stuck nearer to the front the whole disc load/remove action was much improved.

Although cosmetics can be fun, the main point of any review must be to test out the actual device with reference to standard benchmarks (April, *Acorn User*). Figure 1 compares the Microage drives with them. I experienced no data transfer errors during use, and the drives behaved smoothly and quietly once teething troubles were sorted out.

The utilities disc seems similar in content to the Acorn version, except a 'front-page' program is included which simply gives an Acorn/Microage logo. The remainder of the disc included format and verify programs.

The manual is produced by Microage, and well written by Foudan Katan and Jeremy San. It covers each of the main commands in detail. The manual misses out much of the necessary information on file-handling, but does cover assembly language commands for the DFS.

Overall I liked the small size and weight of the drives which meant they easily fitted into any physical system layout. A well-written manual and utility disc is provided, the drives give a large amount of memory space which can be accessed and they're quiet.

The only dislikes were the grey colour, the unbalanced feet and erratic drive draw.

All in all, a potentially useful package at a reasonable price.

Microage 400K 80 track double sided disc drives. Version 0.9E DFS.

No.	Benchmark	5K/ 20 recs	9K/ 100 recs	Disc Overhead	time/K or/rec.
1a.	*SAVE memory	1.80s	2.20s	1.30s	0.10s
1b.	SAVE BASIC prog	2.02s	2.40s	1.50s	0.10s
1c.	*SPOOL " prog	13.15s	22.40s	1.60s	2.31s
2a.	*LOAD memory	1.40s	1.80s	0.90s	0.10s
2b.	LOAD BASIC prog	1.40s	1.80s	0.90	0.10s
2c.	*EXEC " prog	12.40s	21.66s	0.90s	2.30s
	All records use 256 bytes of disc space. Benchtest 3a creates files for use in random access				
3a.	PRINT# serial file	6.18s	25.68s	1.30s	0.24s
3b.	BPUT# with PTR#	58.28s	285.10s	1.10s	2.84s
4a.	INPUT# serially	5.49s	23.39s	1.00s	0.22s
4b.	BGET# with PTR#	37.47s	183.64s	1.10s	1.83s

Figure 1. Benchmarks

BBC MICRO INSTANT MACHINE CODE!

Yes, it's true. Instant machine code from a good subset of BBC BASIC. Type your BASIC program into your model B BBC Micro, trigger the compiler, and your program is changed almost instantaneously into superfast machine code. For £34.95 you get: Cassette version of the complete compiler (along with a version of the compiler for use with discs, ready for when you upgrade, the disc version being dubbed on the cassette after the cassette version); complete compiler listing; extensive documentation and instructions. The compiler was written by Jeremy Ruston.

THE BBC MICRO REVEALED

By Jeremy Ruston

'. . .destined to become the bible of all BBC microcomputer users. . .' (Personal Computing Today). If you've mastered the manual, then this book is for you. Just £7.95

LET YOUR BBC MICRO TEACH YOU TO PROGRAM

By Tim Hartnell

'. . .takes you further into the cloudy areas of the BBC machine than anything else I've yet seen. . .' (Computer and Video Games). If you're just starting out in the world of programming, then this book is the one for you. Forty complete programs, including Othello/Reversi, Piano and a host of dramatic graphic demos. Just £6.45

Interface, Dept. AA
44-46 Earls Court Road, London W8 6EJ
Please send me:

( ) INSTANT BBC MACHINE CODE–tape and book–£34.95

( ) THE BBC MICRO REVEALED–Ruston–£7.95

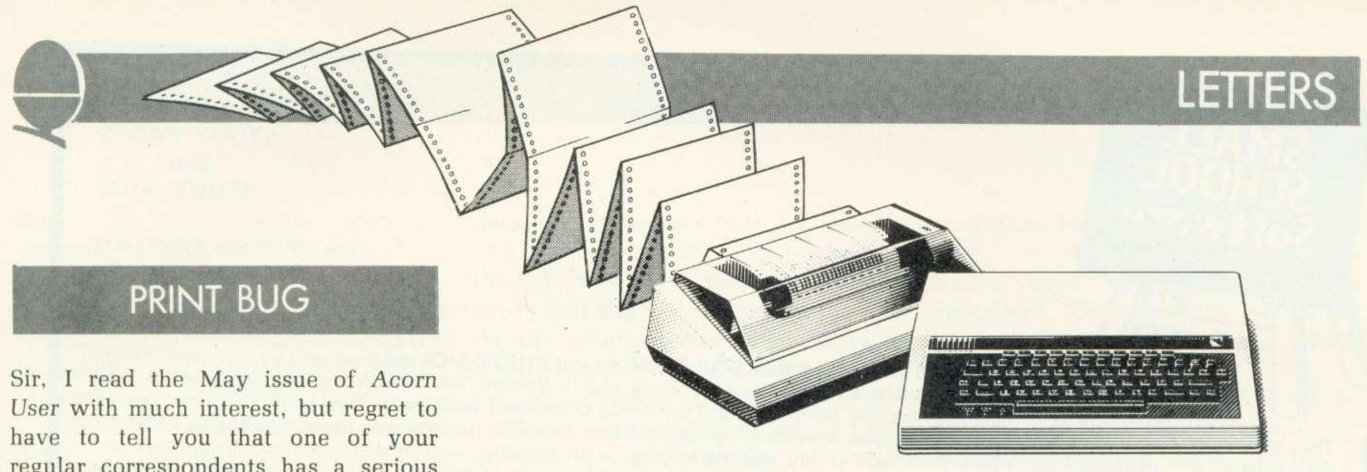
( ) LET YOUR BBC MICRO TEACH YOU TO PROGRAM–Hartnell–£6.45

I enclose £

Name ....

Address ....





LETTERS

PRINT BUG

Sir, I read the May issue of *Acorn User* with much interest, but regret to have to tell you that one of your regular correspondents has a serious misconception. While not exactly incorrect, his solutions are clumsy.

George Hill states that a satisfactory equivalent to LPRINT does not exist, and that the awkward VDU1 command, or tricky window setting is needed. In fact a simple solution is to use VDU21 (which turns off the VDU drivers), send anything you like to the printer, and then turn on the VDU drivers with VDU6! The attached program illustrates this technique.

J.M. Leach
Kent

George Hill replies:

My correspondence with Mr Leach has revealed a bug! His suggestion is neat, and does do precisely as he says with OS 1.2. The bug is in the earlier versions of the operating system, including 1.0, which is what I had at the time.

In these, VDU21 disables the VDU drivers which indeed halts screen output. These VDU drivers should only be prevented from affecting the screen but the control characters needed for printer control (eg, linefeed, carriage return) are also suppressed from the output stream to the printer. This is not apparently intentional, as OS 1.2 allows full output to the printer (except of course for the printer-ignore character).

This explains my own 'serious misconception'.

Thus OS 1.2 has two alternative LPRINT possibilities. *FX3,10 (as explained in September, and referred to by Mrs Pedder), and VDU21. *FX3,0 or VDU6 (respectively) will restore normal output.

VDU1 remains the surest way of sending control characters and escape sequences to the printer, and is the only way of sending *all* codes (0 to 255) to the printer, as is required by many graphics programs. Program 1 and its output with the two operating systems (figures 1 and 2) illustrate the differences between OS 1.0 and OS 1.2.

Mr Leach's reply to my first letter included the following paragraph: '. . . graphics dumps should be in machine code as Basic is much too slow. Several such programs have been published in various magazines. We have the Workstation EPROM from Sussex University, which includes a high resolution dump, and that takes eight minutes to dump the whole screen to the Epson.'

I agree entirely with this comment. Machine code is obviously much faster than Basic, and a start has been made in the September article. I must say that eight minutes is very slow for a machine code dump in EPROM. I have hybrid Basic/machine-code dumps faster than that! My present record is 2.5 minutes for a full eight-colour dump on the Olivetti and 2 minutes 50 seconds for an eight-colour dump on the Epson FX80.

Program 1.

```
 1*FX6,0
 10VDU2
 20PRINT"LINE 1"
 30VDU21
 40PRINT"LINE 2"
 50VDU6
 60PRINT"LINE 3"
 70VDU3
 80PRINT"LINE 4"
>RUN
LINE 1
LINE 2LINE 3
```

Figure 1. Result with OS 0.1. Note lack of linefeed and carriage return

```
>RUN
LINE 1
LINE 3
LINE 4
```

Figure 2. Result is fine with OS 1.2

```
The screen shows
LINE 1
LINE 3
LINE 4
```

The difficulty with assembly language and machine code is that articles explaining the processes involved tend to become too long for a magazine. The copying of assembly language from magazines without understanding is fraught with difficulty – and there are no helpful messages to point out mistakes! I am therefore trying to avoid printing such dumps until the principles have been firmly established. (Last October's issue featured a bare machine code dump for the Seikosha GP100.)

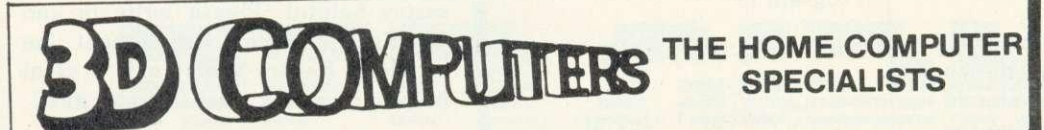
I hope readers are finding the series helpful. Please write in and criticise (or even compliment the articles). Reader reaction is a great help in planning what to cover next!

EARTHING HINT

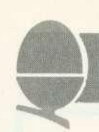
Sir, With reference to Dr Wilson's letter in the August issue concerning an ineffective earth causing damage to his micro, and printer, your readers may be interested in the following.

First, in many homes, especially those over 20 years old, the house earth connection itself may be faulty. This could also cause the problems he experienced. The local electricity supply authority will usually test and rectify this at a reasonable (sometimes free) cost, and I would urge any computer owner to avail himself of this service.

Second, the use of a low current (10 mA) earth leakage trip before the distribution board may have saved Dr Wilson the expense of a repair, and in the event of his receiving a shock due to the earth fault, it would certainly have prevented serious injury. These items are available, ready to use, from



3D COMPUTERS
THE HOME COMPUTER SPECIALISTS



some of the larger electrical wholesalers, but it is important to specify the 10mA type.

In case of difficulty, units of the correct type are available from Burke Electronics in Glasgow, or Gow-Mac Instruments in Gillingham, Kent.

Electrical regulations now demand that an earth leakage trip is used with any mains equipment out-of-doors (eg, power tools, lawn mowers, etc) and this may help justify the cost.

Geoff Cox
Gillinham

TRACE RECURSION

Sir, Jim McGregor and Alan Watt's article on Recursion (July issue) did not define what a recursive program actually is. After studying the listings, it dawned that it includes a procedure which recalls itself and which goes on repeating itself in ever decreasing circles until it is saved by a limiting condition from the fate of the proverbial bird.

I still found it difficult to reason why program 1 listed integers from 1 to n, while program 2 did the reverse. I found that inserting a 'Trace' instruction at the beginning of these programs gave print-outs which immediately clarified what was going on, and how the repetitions were 'nested'. If other readers have not yet grasped what a recursive program is, I commend to them this exercise.

I am still unclear about the relevance of the journey from the *Acorn User* office to the Cunard Hotel to recursive programs, or even of the relevance of the Towers of Hanoi to a pattern of triangles within triangles. However, I do now understand the basis of a recursive program and propose to write a few of my own.

Eric Joscelyne
Cheshire

Recursion takes a bit of work, so keep plugging away. You'll find it worthwhile in the end.

SPACED OUT

Sir, I've just wasted 20 minutes on an obscure feature of BBC Basic. Perhaps I can save some other user the same problem!

I was working on a program which ran almost as expected, but instead of ending, it stopped on an 'out of date' error. This was because one item of data 'FRED' had not been recognised. The problem was that I had corrected the DATA line with the copy key. My finger had lingered on the button, and the BBC interpreted my final datum as 'FRED<space><space> <space>', ie the trailing spaces registered.

While I'm writing, can anyone tell me how to accomplish the following? Useless on it's own, but valuable within a program I'm working on. I've written and phoned Acorn with no reply.

```
10IN.A$,B$
20*RENAME A$ B$
```

Tom Boyd
Seaford College
Sussex

As Ian Birnbaum has pointed out, spaces can cause problems with BBC Basic. So be careful with that copy key.

Your little routine can be accomplished using the Basic command OSCLI or by assembling a string using:

C$="RENAME" + A$ + B$

Then, use the routine on page 463 of the *User Guide.*

EXTRA RAM

Sir, We all know the disadvantage that goes with the good Basic, assembler and high resolution graphics – shortage of user-available RAM. This is particularly critical in applications needing large data access, such as word processors and databases. While discs can provide an answer they have problems: they are slow, and in programs that require manipulation of large chunks of data they can be clumsy.

Paul Beverley's article on the 1MHz interface in the April issue talked of using it to address 64K of RAM (figure 12 on page 64). In the July issue there is mention of a drug labelling system using a 96k expansion board. One of your advertisers (Micro Management) offer a 128k RAM pack. And that is the extent of my knowledge on the subject.

What are the pros and cons of extra paged RAM? Why is so little written about it and why are so few suppliers trying to sell it?

Bernard Dukes
Dorset

There are few pros unless you are prepared to write very odd programs. You ***cannot*** **execute (RUN) Basic or machine-code programs which exist in paged RAM as described. They have to be copied into ordinary RAM first, which defeats the purpose.**

There is no way such RAM can be directly used for programs; only for indirectly-accessed data or as a temporary store. It's not the panacea to memory limitation it sounds.

HOSPITAL USERS

Sir, I understand some of your authors are involved in using BBC micros with the disabled. We are taking a serious interest in this with physically handicapped patients in this hospital together with several hospitals in England which are using them under a pilot project with the DHSS. Do you know of other disabled users of the Beeb and how should they keep in touch with each other?

G. Creasey
Senior Registrar
Edenhall Hospital
Musselburgh, Midlothian

Any special interest groups working with the disabled or in medicine generally, should write in for inclusion in our user group page.

A TO Z

Sir, I recently read a copy of the October *Acorn User* in which there was an article on interfacing the Atom to a ZX printer. I have a model B, BBC micro and was wondering if you had any plans to publish an article on interfacing the BBC micro with a ZX printer. I am sure that there are many BBC micro owners who have a ZX printer and cannot, at the present time, afford a more sophisticated machine.

A. Wilkinson
Hitchin

We have no plans to print an article on interfacing the Beeb with the ZX printer. As you can see from Matthew Bates article, it is a difficult and time-consuming project! However, Matthew apparently had a BBC version of his article accepted by *The Micro User* **in July.**

BBC SPECIALISTS

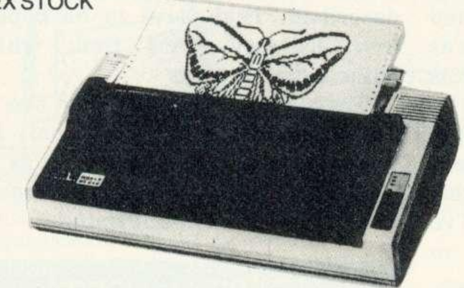
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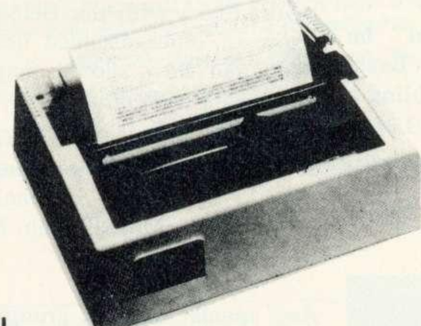
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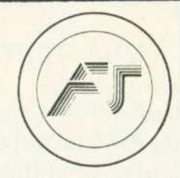
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MISSING LINE AND PROGRAM

How to handle interrupts' by John Ferguson and Tony Shaw in June's issue (page 34) has a mistake. Program 4 has been duplicated, and program 2 should read as below.

Thanks to Mr Naiff from London for pointing this out, and apologies to readers.

Incidentally, Ferguson and Shaw's book *Assembly Language Programming on the BBC micro* from Addison-Wesley should now be in the shops.

CRITICAL VALUE

Sir, I would like to say I value *Acorn User* enough to have a standing order at my newsagents. It's got so much better since the first issue, but I have some general comments.

First, program listings. I *like* typing in listings and learn a lot about program construction when doing that. But your presentation could be much improved to increase legibility. May I suggest you urge contributors to avoid variable names that could be confused. Is it x+I or x+1? P=I or P=1?? O or 0???

In earlier issues you had some programs typeset and the poor compositors struggled to do their best, but spaces became terribly confusing. the answer is to use a constant-width typeface as in the *User Guide*. Now you camera direct from computer printouts. Good. But don't reduce too much. Readers often have poor eyesight. Don't overlay a tint. Maximum legibility please.

Denis Kemp
Cilcaip

We try new things out each issue for listings, such as using different printers, so readers can see what sort of quality is available.

Your other points have been noted, and acted upon (we hope!).

STRING QUERY

Sir, I have a query about the way in which my BBC handles strings. I recently wrote a word-processor program, and to my surprise kept getting the inscrutable 'No room' report. Since the program was very short and didn't use many variables, I concluded it couldn't be due to actual lack of memory.

I have isolated the problem in the two short programs listed below. In both cases, I am building up strings by simple concatenation. In the first, I managed in mode 4 to get almost five 245 character strings. In the second, I achieved almost 57 before the dreaded 'No room' appeared. Why should this be?

The *User Guide* is silent on this particular problem. One of the things which puzzles me is that I thought that by dimensioning a string, sufficient space was put aside. If this is the case, the space is being taken up by some other variable. Can you suggest a solution?

```
  5 REM first way does 4 and a bit A$s
 10 DIM A$(100)
 20 FOR N=1 TO 20
 30 FOR M=1 TO 245
 40 LET A$(N)=A$(N)+"X"
 50 NEXT M
 60 NEXT N
 90 STOP

100 REM another way . . .does 57
    A$s
102 CLEAR
105 DIM A$(100)
110 FOR N=1 TO 100
115 LET X$="X"
120 FOR M=1 TO 245
130 LET X$=X$+"X"
140 NEXT M
145 LET A$(N)=X$
150 NEXT N
```

Can you tell me how I can get a report which shows me the size of the program *plus* the amount of space taken up by the variables which have been declared or dimensioned in the program?

Finally, is there any way I can re-dimension a variable within a program without CLEARing all the rest? This is something which would be useful in programs which depend on calculation to come up with a precise dimension, but where one might want a re-run without wiping out other crucial data.

Michael Johnson
London

DIMA$(100) only sets aside space for the pointers, not the strings.

To fix space for strings, you should fill them up to the maximum length needed for each one by A$=SPC(#), where # is the space needed.

To find out how much space a program takes up, use PRINT TOP-PAGE. For the variable space use:

DIM A% 0
PRINT HIMEM–A%

So the whole calculation is:

DIM A% 0: PRINT (TOP-PAGE)+ (HIMEM–A%)

Your last point has us stumped. Any offers stand a good chance in the Beeb Forum.

Replaces program 2, June, page 34

```
10 REM DISABLING IRQ INTERRUPTS
20P%=&0D01
30[
40.START SEI            \DISABLE IRQ INTERRUPTS
50       LDX #&FF       \DELAY ROUTINE
60.AGAIN DEX
70       BNE AGAIN
80       CLI            \ENABLE IRQ INTERRUPTS
90       RTS            \BACK TO BASIC
100]
110 CALL START
120 END
```

TELEPRINTERS AND CARRIAGE RETURNS

Sir, I was disappointed to see that teleprinters were ignored in the March issue's article on printers – a mistake in my view, since they are an easy way to obtain a reasonable printer which the impecunious, myself included, can afford.

The RS423 does not support 110 baud but *Beebug* have suggested a fix for this.

Thus ASR 33 teletypes would work perfectly well but for one thing, and I would appreciate help on this since machine code is a mystery to me. The carriage return is slow, and the first character of each line is printed during the return motion. This can be remedied, by inserting two extra chr$(13) at the beginning of each string to be printed. This is not possible (in Basic at least) if it is a program listing which is required, and a machine code 'fix' to amend the OSASCI routine would be a much better solution. Teletypes, I understand, normally have the CR first followed by six nulls and then the LF. If anyone can suggest a routine to achieve this I would be most grateful.

Meanwhile, congratulations on a first class magazine.

N.G. Smith
Kent

After much correspondence, program 1 emerged – a machine-code fix to insert the necessary carriage returns as requested.

First, a little information about the problem. The teletype does not send an electrical signal to interrupt the flow of data from the computer. Hence for data transfer to be possible, it is necessary to short the CTS and RTS lines at the computer end, which fools the computer into thinking the teletype is permanently in the 'ready' state. Further, the DSR and CD (data set ready and carrier detect) lines on the teletype have to be kept *high*, so a link from RTS at

```
10 REM ***TELETYPE DELAY***
20 REM * Version 3 _ extra returns *
30 REM G.B.HILL 1983
40 MODE7
50 REM locate program
60 S%=PAGE-&100
70 REM To change number of extra CR's
inserted change ?cr_number at line 90
80 cr_number=S%
90 ?cr_number=2
100 S%=S%+1
110 REM store original WRCHV
120 old_wrchv=S%
130 ?old_wrchv=?&20E
140 ?(old_wrchv+1)=?&20F
150 S%=S%+2
160 REM assemble code
170 FOR opt=0 TO 2 STEP 2
180 P%=S%
190 [OPT opt

200 \MAIN PROGRAM
210 .new_wrchv          cmp #&0D            \test for CR
230                     bne old_oswrch      \go on if not CR
240                     jsr extra_crs       \insert extra CRs
260 .old_oswrch         jmp (old_wrchv)     \output through old routine
270 \
280 \SUBROUTINE TO INSERT EXTRA RETURNS
290 \
320 .extra_crs          pha:txa:pha         \preserve accumulator and X register
330                     ldx cr_number       \set counter
340 .loop               lda #&0D            \CR
350                     jsr old_oswrch      \output through old routine
360                     dex
370                     bne loop            \go back until cr_number inserted
380                     pla:tax:pla         \restore X register and accumulator
390                     rts
400 ]

410 NEXT opt
420 *KEY0?&20E=&03:?&20F=(PAGE DIV &100 -1)|M
430 *KEY1?&20E=?(PAGE-&FF):?&20F=?(PAGE-&FE)|M
440 VDU12
450 PRINTTAB(5,10);"PRESS KEY0 TO INSERT EXTRA RETURNS,";TAB(5,12);"KEY1 TO CA
NCEL"
460 END
```

Program 1. Provides extra carriage returns for teletype printers.

Figure 1. Teletype connector



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the computer to both these lines is also needed. Finally, 'data out' is connected to RD (received data) and a signal ground is connected, and all systems should go. Figure 1 shows a typical lead.

The 'fix' for 110 baud was published in *Beebug* issue 3 page 10. This actually produces a rate of 108.3 baud rather than 110, and it may be necessary to adjust the teletype to accept the slightly lower rate.

The extra carriage returns are needed because the teletype lacks an electrical 'busy' signal, hence it prints immediately any character received. Its normal printing speed is limited by the 110 baud rate. When a carriage return is encountered the printhead has to move back to the beginning of the line. This mechanical operation takes longer than the printing of a single character, and so several characters may be lost from the beginning of the next line.

The solution is outlined in Mr Smith's letter, and program 1 inserts two extra carriage returns (&0D) *before* the one sent out by the computer. It could be modified to send six nulls (&00) after the carriage return, but I see no advantage in this. The extra carriage returns have no adverse effect on the computer's operation in text mode, though any program using VDU calls, either explicitly or implicitly (eg PLOT) may well get upset.

The delay is therefore switched on by pressing function key 0 and normal output should be restored on pressing key 1.

The routine and its variables are stored relative to PAGE, which means it should work with all machines; tape, disc and Econet. Any program which uses key0 or key 1 will interfere, as will any attempt to use the 'spare' space just below PAGE. Any alteration of PAGE will alter the action of the function keys and once you have ascertained the initial setting of PAGE on your machine, it might be better to change lines 60, 420 and 430, using:

- &E00 in place of PAGE on tape machines;
- &1900 in place of PAGE on disc machines;
- &1B00 in place of PAGE on Econet machines.

To use the teletype you would first select the RS423 output at 110 baud (after operating the installed switch). Then enable linefeeds, and finally run program 1. Then,

```
*FX5,2
*FX8,1
*FX6,0
CHAIN"TTYPE"
Now press key 0
```

and LIST or PRINT commands should produce output at the teletype following CTRL B or VDU2 commands. When the printer is no longer needed, CTRL C or VDU3 followed by key 1 should restore normal output.

The teletype is a bulky, noisy, slow machine, but it produces typewriter-standard output of printed matter. Its principal advantage is that second-hand ones can be obtained very cheaply!



*FX3 ILLUSTRATED

Sir, Having just bought the May issue of *Acorn User*, I was interested to read your article on printers. We currently have OS 1.2 and have found that *FX3,10 if used in the appropriate place will not only disable the screen, but will also make redundant those never-ending VDU 1, n commands. As long as the *FX3,10 is issued before the VDU 2, and the VDU 3 is issued before the *FX3,0 – this seems to make any PRINT and VDU commands inbetween operate exactly as LPRINT commands. I enclose a short program (program 1) to demonstrate this, and an example of the output. The printer used is an Epson MX80 FTIII.

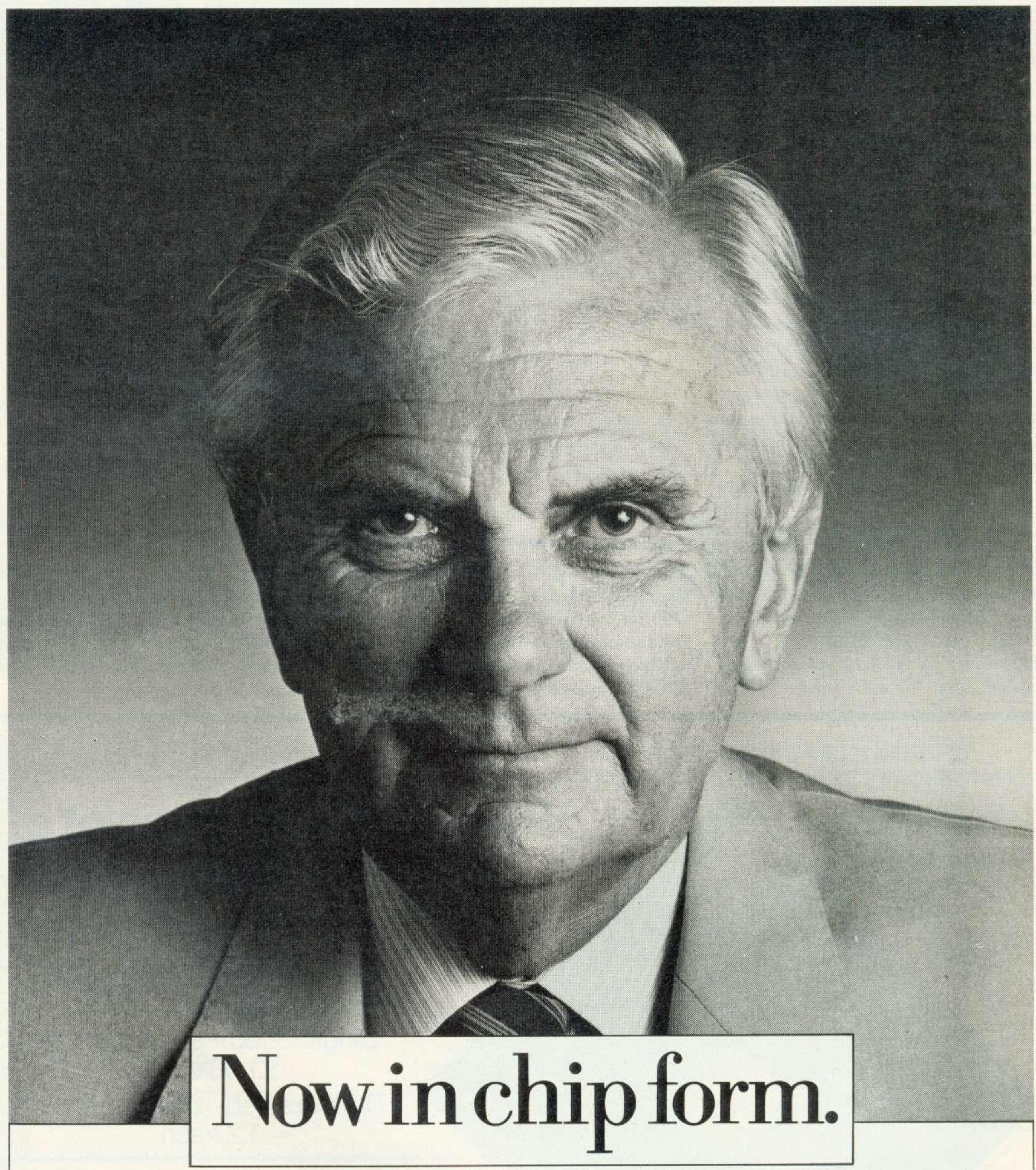
Mrs. C.A.Pedder
Leeds

```
 10 CLS
 20 *FX3,10
*30 VDU 2:REM TURN ON PRINTER
 40 VDU 27,64:REM INITIALISE PRINTER
 50 VDU 14,27,45,1
 60 PRINT "HEADING"'':REM DOUBLE WIDTH UNDERLINED
 70 VDU 27,45,0:REM TURN OFF UNDERLINING
 80 PRINT "LINE 1"
 90 PRINT "LINE 2"
100 PRINT "LINE 3"''
110 VDU 27,68,20,30,40,0:REM SET TABS
120 VDU 9
130 PRINT "COL 21";:VDU 9
140 PRINT "COL 31";:VDU 9
150 PRINT "COL 41"
160 VDU 12:REM FORM FEED
170 VDU 27,64:REM INITIALISE PRINTER
*180 VDU 3:REM TURN OFF PRINTER
190 *FX3,0
200 END
```

```
HEADING
LINE 1
LINE 2
LINE 3
```

Demonstrates use of *FX3,10. Note lines 30 and 180 are not needed

This letter illustrates almost perfectly the use of *FX3,10 which was described in detail in the last issue. Lines 30 (VDU2) and 180 (VDU3) in program 2 are unnecessary as *FX3,10 automatically enables the printer and *FX3,0 disables it again. Don't forget that the 'printer-ignore' character (set by *FX6,n) remains ignored! Thus any codes needing to send 0 (eg ESC 0 to set line-spacing, or ESC R 0 to select the USA character set on an Epson) still have to be sent via VDU1 (unless you choose to suppress a character other than 0). Also note you cannot get the suppressed character through via VDU1 while using *FX3,10.



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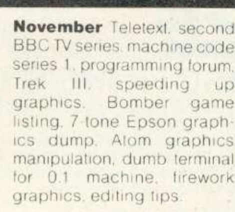
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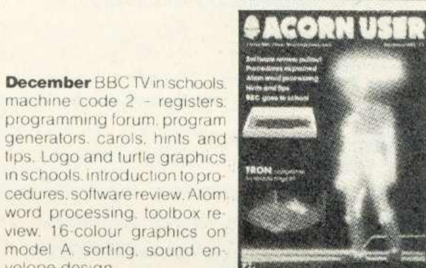
July/August The first issue. Articles on drawing techniques, the BBC Computer Programme, machine code graphics, questions and answers, hints and tips, sound, interfacing scientific instruments, dumb terminals for 0.1 machines, disc drives, Econet in schools.

September Ceefax telesoftware, Beeb in business, mailing list, simple files, 30-Hour Basic course, art on a micro, music, BBC micro as a keyboard, extra Atom commands, BBC Basic board, ULA design, teletext graphics, machine code graphics, analogue input, schools training, 0.1 cassette bug patch.

October Electron details, BBC TV series – confessions, two Epson graphics dumps, Seikosha GP100 dump, Worldwide networking for BBC micro, garbage handling, voice ROMs, sound pitch envelope, moving graphics, ZX printer for Atom, RGB colour separations for Atom, biofeedback, book reviews.



November Teletext, second BBC TV series, machine code series 1, programming forum, Trek III, speeding up graphics, Bomber game listing, 7-tone Epson graphics dump, Atom graphics manipulation, dumb terminal for 0.1 machine, firework graphics, editing tips.





December BBC TV in schools, machine code 2 – registers, programming forum, program generators, carols, hints and tips, Logo and turtle graphics in schools, introduction to procedures, software review, Atom word processing, toolbox review, 16-colour graphics on model A, sorting, sound envelope design.



January MEP school launch, *FX commands for sound, second BBC TV series, machine code 3 – two pass assembly, disc drives for the Beeb, programming forum, program protection, micros in schools – new series, Commodore Pet printer used with Beeb, BBC programs written on an Atom, extra Atom memory.

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*OPT8,n	Allows 80 track drives to read 40 track diskettes
*SYS	Selects either Acorn mode or Extended mode

There is a built-in formatter which will format in either forty or eighty tracks in both modes of operation. This formatter also allows for user definable parameters to be included for the development of software protection.
With this disc filing system a user definable buffer can be used while compacting the disc. This will enable disc compacting to be carried out without overwriting any program in memory.
Alternatively a new disc may be formatted without any resident program being overwritten.
This DFS also allows for the use of wildcard characters, using either the #symbol for a single wildcard and the * character for multiple wild characters (e.g. CHAIN P* could be used to chain a program called PRINTER as long as there are no other files whose names begin with P).
Has many friendly features such as assisting in transfer of cassette files to disc. This DFS is totally compatible with Econet etc., and is complete with a utilities disc and comprehensive manual. The utilities disc contains many useful programs including machine language printer screen dumps in all modes, including High Res. (Epson & NEC 8023). It also has a nibble editor to scan discs, read data, edit them, and then write back to the disc.
Also included is an eight-way DIL switch which may be used to select the start-up options; these are:

Link 1	Determines if the system starts up in 40 or 80 tracks.
Link 2	Select Acorn or Extended mode at start-up.
Link 3 & 4	Selects type of drive ie. Shugart, Canon etc.
Link 5	Select auto-boot or not, on "break"
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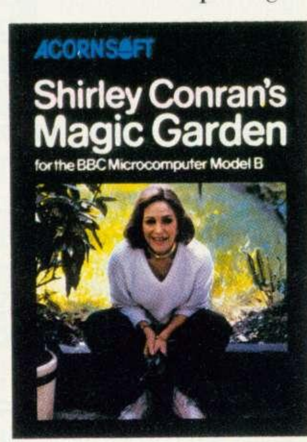
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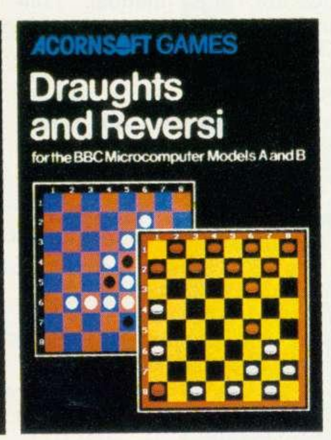
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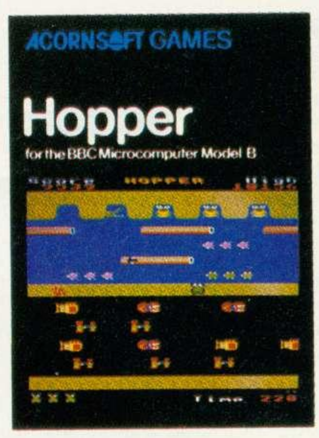
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– TOP QUALITY MACHINE CODE PROGRAMS –





HUNCHBACK (32K) £7·95

An excellent version of the arcade game where Quasimodo attempts to rescue Esmeralda. Beautifully detailed animation (the best we've yet seen!) as Quasimodo leaps over the ramparts dodging rocks and arrows, swinging on ropes, avoiding the guards' spears, and ringing the bells. Twelve different screens of action, starting easy and becoming extremely difficult. Choice of starting speed and skill level. A programming masterpiece! (For use with KEYBOARD or JOYSTICKS).
••• NEW RELEASE •••



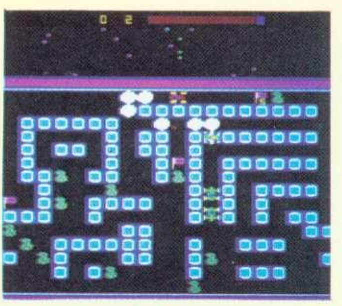
Q*BERT (32K) £7·95

A great new arcade game reaches the BBC micro. In this game, you have to move over a pyramid of blocks altering the colour of the blocks as you pass over them. Easy! Except that you have to avoid the balls, which tumble down towards you, and the pyramid's snake, which has a deadly sting. Transportation discs can be used to help you in your increasingly difficult task. Sound effects, hi-score, rankings, skill levels.
••• NEW RELEASE •••



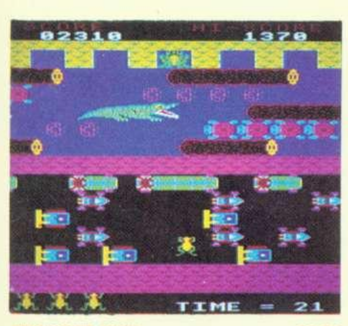
CENTIPEDE (32K) £7·95

Incredible arcade type game featuring mushrooms, snails, flies, spiders, and the centipedes of course. Excellent graphics and sound. 6 skill levels, hi-score, rankings, bonuses, and increasing difficulty as the spiders become more lively and the number of mushrooms increases.
(For use with KEYBOARD or JOYSTICKS).
"Visually this game compares well with the arcade version, being colourful and clear."
. . . YOUR COMPUTER



ROAD RUNNER (32K) £7·95

The only full feature machine-code version of the arcade game available for the BBC micro. Features include: scrolling screen, radar display, checkpoint flags, fuel gauge, smoke screens, 6 skill levels, rankings, increasing difficulty, and sound effects. (For use with KEYBOARD or JOYSTICKS).
"The game becomes very hard and has very smooth graphics. Excellent."
. . . BEEBUG MAGAZINE



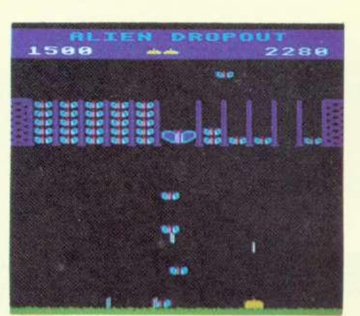
FROGGER (32K) £7·95

Not just another version of Frogger . . . this is the arcade-quality version that you've been waiting to see. Graphically brilliant with gaping-mouthed crocodiles, diving turtles, flies, and frogs that flex their legs as they jump along. Increasing difficulty, and responsive controls.
(For use with KEYBOARD or JOYSTICKS).
". . . very good indeed . . . fast flicker-free graphics and a frog that really hops!"
. . . BEEBUG MAGAZINE



SPACE FIGHTER (32K) £7·95

Arcade-style game based upon features from DEFENDER and SCRAMBLE. 5 types of menacing alien fire at you and may attempt to ram you. Separate attack phases, fuel dumps, repeating laser cannon, asteroids, smart bombs, hi-score, rankings, 6 skill levels, sound effects.
"A thoroughly enjoyable program, well worth the money . . ." . . . HOME COMPUTING WEEKLY



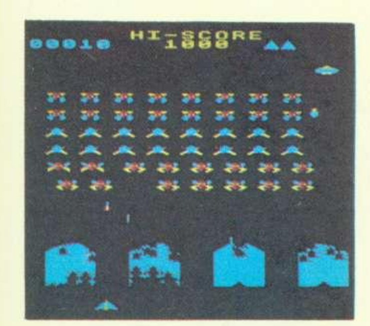
ALIEN DROPOUT (32K) £7·95

Based upon the arcade game of ZYGON, but our version improves upon the original arcade game itself. You have to shoot the aliens out of their "boxes" before the "boxes" fill up. Once full, the aliens fly down relentlessly, exploding as they hit the ground.
(For use with KEYBOARD or JOYSTICKS).
". . . these moths are out to get more than the clothes in your wardrobe" . . . YOUR COMPUTER



GALAXIANS (32K) £7·95

Fast action version of the popular arcade game. 4 types of Galaxian (in 3 initial screen formations) swoop down individually or in groups of two or three. 6 skill levels, hi-score, rankings, bonus laser bases and increasing difficulty. Superb sound effects and graphics.
". . . well produced, with colourful graphics, responsive controls and the usual bunch of extra terrestrials." . . . YOUR COMPUTER



INVADERS (32K) £7·95

Superb version of the old classic arcade game, with novel enhancements. 48 marching invaders drop bombs that erode your defences, and two types of spaceship fly over releasing large bombs that penetrate through your defences. Increasing difficulty, hi-score, superb graphics and sound. (For use with KEYBOARD or JOYSTICKS).
". . . well produced, with colourful graphics."
. . . YOUR COMPUTER

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BOOTS – Selected branches
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BUCON LIMITED, 18 Mansel Street, Swansea.
WEST COAST PERSONAL COMPUTERS, 47 Kyle Street, Ayr.
MICROSTYLE, 29 Belvedere, Lansdown Road, Bath.
ELECTRONEQUIP, 36-38 West Street, Fareham, Hants.
BYTEWARE LIMITED, Unit 25, Handyside Arcade, Newcastle.
MICRO MANAGEMENT, 32 Princes Street, Ipswich.
3D COMPUTERS, 230 Tolworth Rise South, Tolworth, Surrey.



FRUIT MACHINE (32K) £7·95

Probably the best fruit machine implementation on the market. This program has it all . . . HOLD, NUDGE, GAMBLE, spinning reels, realistic fruits and sound effects.
"The graphics are very good . . ."
. . . YOUR COMPUTER

COLDITZ ADVENTURE (32K) £7·95

Can you escape from Colditz with everything you need to get home? Graphics are used at important stages in the game, and a haunting tune plays as you start the quest. A challenging adventure requiring careful logical thought to make your escape.
••• NEW RELEASE •••

CRIBBAGE (32K) £6·95

An impressive version of the card game of cribbage. Play against the computer, and see the scores being pegged onto the cribbage board. Very good graphics, and the computer plays extremely well. Full verification at all stages of play.
••• NEW RELEASE •••

PONTOON (32K) £6·95

Up to 6 players can play against the computer as banker; or you can play individually against the computer, with alternating banker. Very good graphics, and the game features all standard rules, including "splitting pairs".
••• NEW RELEASE •••

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MOON RAIDER (Model B) £7.95
As pilot of the highly manouverable Space Fighter you must try to penetrate the defences of the alien moon. Your craft is armed with a rapid-fire laser cannon and a large quantity of the latest Tryex bombs. Against you are self-firing rockets, nuclear Ack-Ack guns, spacemines, 'Fizzers' and meteors not to mention the network of narrow passageways that need to be negotiated. You have only limited fuel which must be replenished by either bombing the enemy fuel dumps or docking with the refuelling station. There are 6 phases to get through and 4 levels of difficulty. The game can be started at any phase and on any level. The controls are either from joysticks or from standard or user-defined keys. A game of the very highest standard.
DANGER! UXB £7.95
An explosive new, machine code release from Program Power. Based on the popular arcade game, the object of Danger UXB is to run and slide from bomb to bomb, defusing them as you go. Three levels of starting difficulty cater for all levels of player, each level being progressively harder. Every skill level has its own 'Hall of Fame' with scores ranked from poor to master. Excellent graphics and sound, along with great attention to detail (such as the Stomping Boots and Bonus points), make this a very addictive game.
CHESS (Model A £5.95 Model B £7.95)
Our excellent machine code program — now with superby MODE 1, colour graphics. Six skill levels, play black or white, illegal moves rejected, 'en passant', castling, take-back of moves, and include Blitz Chess where you must move in 10 seconds, set-up of positions for analysis, replay of a game just played and saving of part completed games on tape. On loading, a 1972 Spassky/Fischer game can be replayed.
DANGER! UXB
CHESS
MOON RAIDER
MICRO POW
3D
WATCH OUT FOR FELIX
Other programs available: Killer Gorilla £7.95/Demon Decorator £6.95/Croaker £7.95/Alien Swirl £6.95/Reversi (A or B) £5.95/Asteroid Storm £7.95/Laser Command £7.95/Swoop £7.95/Wall £5.95 Beebtote £5.95/ Caveman Adventure £6.95/Labyrinths of Lacoshe £7.95/Adventure £7.95/World Geography £6.95/Where? £6.95/Constellation £6.95/Physics £6.95/Chemistry £6:95/Junior Maths Pack £6.95/Barrage £7.95/Galactic Commander £7.95/Timetrek £7.95/Footer £7.95/Poker Dice £5.95/Filer £9.95/Beebmon £7.95/Draw £9.95/Disassembler £6.95.
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